

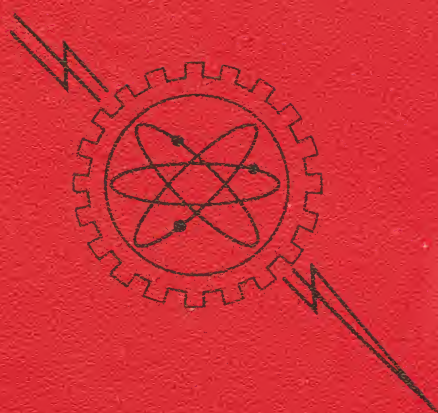
**AFIT**  
**Wright-Patterson AFB, Ohio 45433**

**UNITED STATES AIR FORCE**  
**OFFICIAL BUSINESS**

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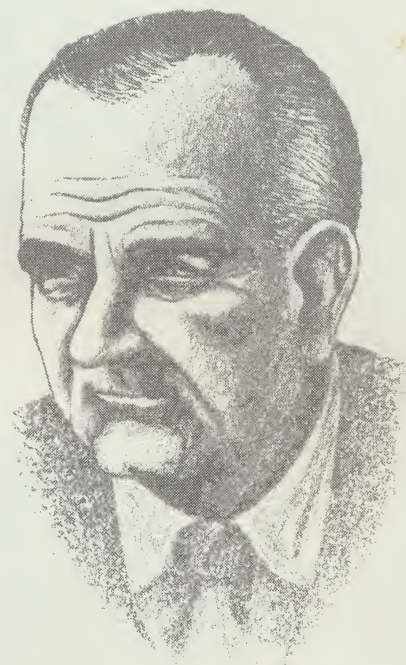
AIR FORCE INSTITUTE OF TECHNOLOGY

Air University









"...the Institute  
has made many  
outstanding contributions  
to the building of the  
greatest military power  
in history;  
a power dedicated to  
the preservation  
of peace and freedom  
throughout the world..."





Lieutenant General John W. Carpenter, III

# Air University -

## Air War College

To provide instruction that prepares senior officers for high command and staff duties. This is accomplished by developing a sound understanding of the elements of national power to insure the most effective development and employment of aerospace power.

## Air Command and Staff College

To improve the professional ability of selected officers for command and staff assignments that are normal to field grades, and to contribute to the development of sound Air Force command and staff doctrines and practices.

## Squadron Officer School

To prepare selected lieutenants and captains to execute the command tasks normally associated with squadrons, to perform staff tasks encountered by junior officers, and to provide these officers with a foundation for further professional development.

**A**ir University is a major command of the United States Air Force. It is the organization that includes the higher Air Force schools, colleges, and related educational and research activities. Its students consist largely of Air Force officers, airmen, and professional civilians. A relatively small number of personnel from other services in the Department of Defense and from other government agencies are also included among its students. In addition, allied officers from 62 countries attend Air University schools. Cadets in the Air Force ROTC Program are selected from students enrolled in colleges and universities having Air Force ROTC programs.

To equip the Air Force professional man with the knowledge and background neces-

sary for successful leadership continues to be Air University's main objective. As an Air Force educational, doctrinal, and research center, the command provides education to meet Air Force needs in scientific, technological, managerial, and other professional areas.

Air University operates programs at many locations to accomplish its far-reaching mission. Three professional graduate in-service schools—Squadron Officer School, Air Command and Staff College, and Air War College—conduct courses at Maxwell Air Force Base. At Wright-Patterson Air Force Base, Ohio, the Air Force Institute of Technology offers programs at the bachelor, master, and doctoral levels in the resident School of Engineering and in selected civilian colleges and universities. The Warfare Systems School at



# The Air Force Educational Center

## Air Force Institute of Technology

To provide education and training to meet the requirements of the Air Force in scientific, technological, managerial, medical, and other areas as directed by Headquarters United States Air Force.

## Aerospace Studies Institute

To conduct research, develop concepts, and prepare studies and monographs responsive to the needs of the United States Air Force and Air University on aerospace power and its relationship to other instruments of national power.

## Academic Instructor and Allied Officer School

To increase the instructional capabilities of selected Air Force personnel by developing their understanding of the basic principles of learning; and to enhance the qualifications of selected Allied officers for attendance at Air University schools.

## Warfare Systems School

To instruct selected personnel in the entire spectrum of warfare, from counterinsurgency to space and ballistic systems, and to acquaint officers with the general characteristics of Air Force weapons, delivery systems, and problems associated with their employment.

## Air Force Reserve Officers Training Corps

To commission graduates, through a college campus program, as career-oriented second lieutenants in response to Air Force requirements.

## Extension Course Institute

To conduct and administer the United States Air Force Extension Course Program in accordance with policies and procedures approved by the Commander, Air University, and Headquarters United States Air Force.

Maxwell conducts many short courses in aerospace weapons operations and employment, counterinsurgency, and personnel management. Another organization at Maxwell, the Academic Instructor and Allied Officer School, trains instructors for Air University as well as for other Air Force activities. Two pre-commissioning programs, the Air Force ROTC with headquarters at Maxwell and the AFIT Airman Education and Commissioning Program, provide a steady source of young officers to meet the Air Force's continuing need for professional aerospace personnel.

Air University officials recognize that research cannot be bought blindly off the shelf. Research, consequently, receives continuous emphasis. Although the Aerospace Studies

Institute and the Air University Library, both at Maxwell, are full-time research centers, all the command's professional schools engage in research programs of varying lengths and complexities. And to complement its educational system, Air University operates the Extension Course Institute, the correspondence school of the Air Force, at Gunter Air Force Base.

With space vehicles now advanced from the theoretical to the factual stage, Air University is prepared to meet even more demanding challenges, for today the need for the professionally-competent air officer is more critical than ever. Mindful of a great public trust, this Air Force educational center will continue to provide this nation with top-quality aerospace leaders. ■ ■ ■





**Major General Victor R. Haugen**

**from the Commandant...**

## **The Year in Review**

*... a Distinguished Service Medal to the retiring Commandant*





**A**s we review our experiences during the past year, we quickly note the many areas in which truly noteworthy progress has been made. We observe also that at times our plans had to be adjusted to coincide with the urgent demands thrust upon our nation because of its dominant role of leadership in world affairs. This adjustment has presented challenges to our often-demonstrated versatility in accomplishing our purpose—that of providing education to members of the Air Force as set forth in our mission requirements. As we try to envision the future, we are aware that these challenges will continue, and, in all sincerity, we would not have it otherwise, for challenge is the backbone of progress.

Although my tenure at AFIT has been of relatively short duration, I have become extremely conscious of the accomplishments of my most able predecessor, Major General Cecil E. Combs, and of the wonderful support he has received from the faculty and staff. And as I review these achievements, I experience a great sense of admiration for an organization that is able to fulfill its mission so capably while adjusting to changing situations.

The most serious problem has been the difficulty the Air Force has encountered in identifying a sufficient number of technically-qualified officers who can be made available to fill the educational quotas in science and technology. This is due to a number of reasons, but is, of course, conditioned greatly by the conflict in Southeast Asia. If previous predictions of Air Force needs are valid, this could develop into a shortage of potential students for these critical engineering and scientific specialties. As a partial remedy to the situation, AFIT is attempting to develop a means for redirecting the education of officers with baccalaureate degrees in nonscientific fields and for providing refresher and up-dated courses for officers lacking sufficient grades to enter graduate scientific and engineering programs. AFIT's major effort in this direction will be in the School of Engineering where frequently-tested flexibility exists.

The shortage of available officers in critical areas also had an adverse effect on programs monitored by the Civilian Institutions Division. These programs provide for college education for Air Force officers through

*. . . a welcome to the new Commandant . . . a master's degree to an Air Force officer*





regular college-degree programs in civilian educational institutions. Here, also, a reduction in enrollment was especially heavy in the engineering field where the drop was over 50 per cent. However, this was counter-balanced somewhat by an increase in the number of enrollees in management programs.

The Minuteman Education Program is an example of AFIT's capability for establishing programs on short notice to meet Air Force needs and contingencies. This program is

spite of the unexpected initial attrition rate, which resulted from reasons other than scholastic aptitude, the Malmstrom program is clearly a success.

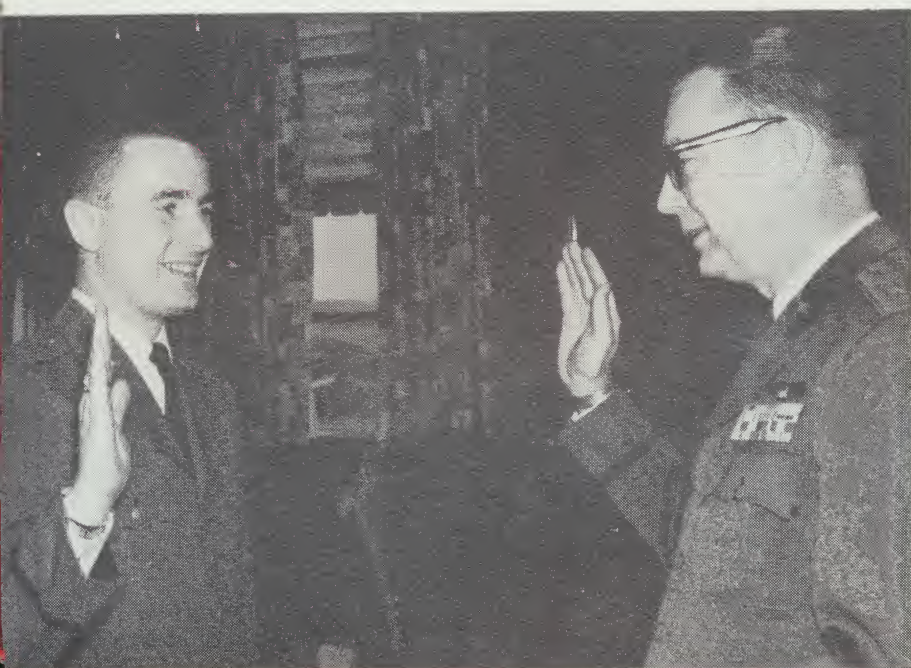
The new doctoral program offered by the School of Engineering marks AFIT's entrance into the highest level of academic endeavor. United States Air Force approval to offer a doctor of engineering science program and appropriate accreditation by the North Central Association of Colleges and Secondary Schools preceded enrollment of the initial class of twelve.

Further evidence of maturity and growth were shown by the strengthening of our mutual faculty exchange program with the College of Aeronautics at Cranfield, England; the hosting of an international conference on structural mechanics sponsored by the School of Engineering's Department of Mechanics; and the hosting of the annual student conference of the American Nuclear Society by the AFIT chapter of the ANS. The visiting lecturer's program, generally in the humanities, has been augmented by a scientific lecture series hosted by the AFIT Sigma Xi Club and sponsored by the Air Force Office of Aerospace Sciences.

The activation of the Air Force Nuclear Engineering Test Facility (AF NETF) and

## The Year in Review

described in detail in another part of this report. However, I would like to note here that AFIT has activated five programs at various Minuteman missile sites since 1962 and is preparing to inaugurate a sixth in July 1966 at Grand Forks Air Force Base, North Dakota. One cycle at Malmstrom Air Force Base, Montana, and the first to be activated, has been completed, and students of this first group were awarded masters' degrees in aerospace engineering in the fall of 1965. In





its acceptance by AFIT as an Air Force research laboratory present another avenue of opportunity through which the Institute may be of service to the United States Air Force. An extensive research program is planned for the NETF, and the work that has been accomplished toward its fulfillment indicates attainment of a high level of achievement.

The School of Systems and Logistics continued to grow and to develop new offerings to meet Air Force requirements. This was particularly noticeable in the continuing education courses, where course offerings were revised, added, or deleted as dictated by the requirements of the using commands. The limitations on resident enrollments in the continuing education courses are those imposed by housing at Wright-Patterson AFB rather than by demand from the using agencies. In order to alleviate this restriction to some extent, but more importantly to provide education when and where it was needed, many short courses were given on site at bases in the United States and overseas. AFIT's activity in on-site work is growing and is further manifestation of our endeavor to meet validated educational needs wherever and whenever we are capable of doing so.

The concept of providing continuing education programs on site emerged as a new

and important contribution of the Civil Engineering Center, particularly in Southeast Asia where new problems of construction became the order of the day.

The new and distinctive program in Defense Weapon Systems Management, sponsored by the Department of Defense, is rapidly proving its effectiveness. Although all AFIT organizations accept enrollees from the other services, the Defense Weapon Systems Management Center is specifically established for this purpose. The wholehearted cooperation provided by the many experts from the services, from the Department of Defense, and from industry who participate as lecturers provide an up-to-date fount of knowledge of inestimable value.

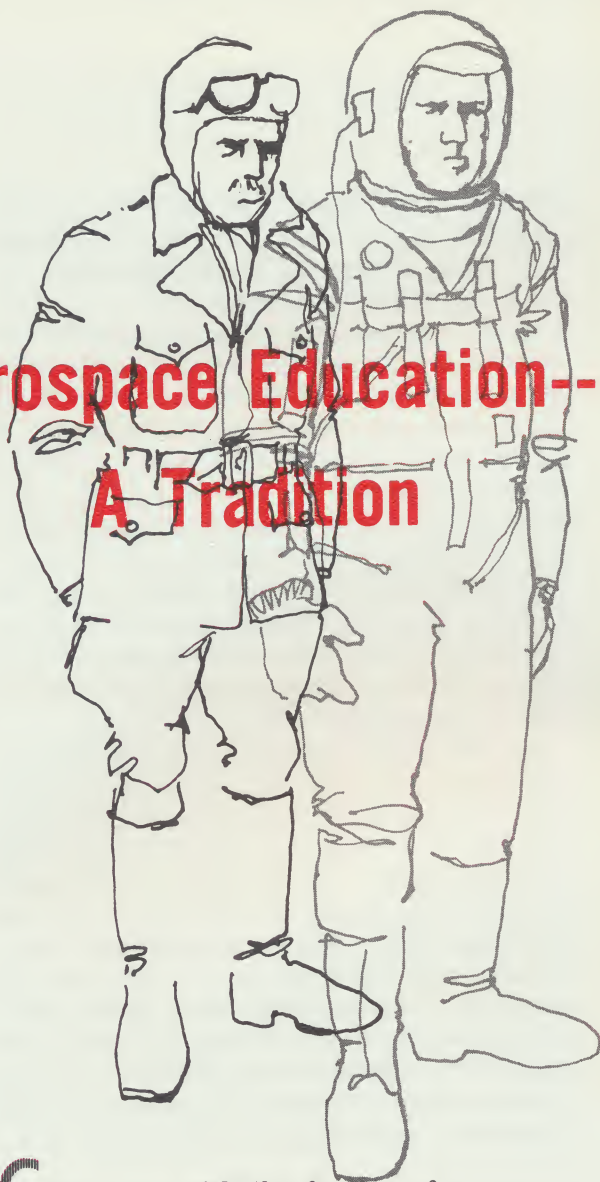
As the year's activities are reviewed in retrospect, it is amazing to note the growth in the size and scope of the operation over that of a few years ago. The fact that over 15,000 students were enrolled in AFIT programs during fiscal year 1965 would seem to prove that the faculty and staff have been successful in their constant efforts to improve the quality of their work and to adjust their methods of operation to ever-changing conditions. The extension of AFIT's influence further attests to its ability to meet Air Force educational requirements at the highest level.

■ ■ ■



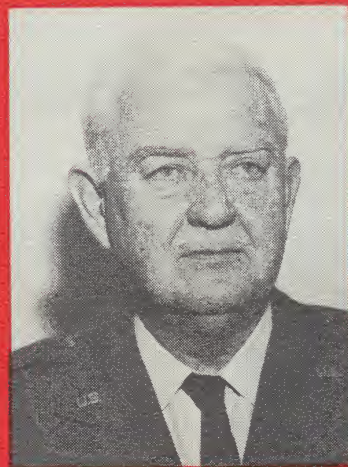


# Aerospace Education-- A Tradition



Concurrent with the forging of aerospace power, there emerged a new breed of fighting men. These men recognized the dynamic capabilities of aerospace vehicles, and their pioneering work in observation balloons, blimps, DHs, and Jennys fired their imaginations. Being both visionaries and realists, they sought to accelerate the development of an air vehicle that would fly faster, further, and more safely. They felt that the answer lay in technical education.

Among the first schools specializing in aeronautical engineering was the Army's Air School of Application, which was established at McCook Field, Dayton, Ohio, in 1919. This school, the predecessor to the Air Force Institute of Technology (AFIT), was placed under the command of Colonel Thurman H. Bane, who conceived the original idea of an aeronautical school within the Army. With a student enrollment of seven officers and a faculty



Col. John A. McCann, M.A.  
Deputy Commandant



Howard W. Barlow, Eng. Sc.D., P.E.  
Academic Director

composed of engineering specialists assigned to McCook Field, the school held its first class in November.

Through the years the school has grown both in stature and in enrollment and has taken a prominent position in the academic community. An expansion of its resident facilities now includes a School of Engineering, School of Systems and Logistics, Civil Engineering Center, and Defense Weapon Systems Management Center.

In addition to its resident programs, AFIT, through its Civilian Institutions Division, monitors the academic programs of some 4,500 officers and airmen attending civilian colleges, universities, hospitals, and industrial organizations located throughout the United States and overseas. Responsibility for this program was delegated to AFIT in August 1947. These programs, which include degree and nondegree at all levels, are designed to





Col. Charles W. Sampson, M.S., P.E.  
Director, Programs



Lt. Col. Thomas L. Parella, M.A.  
Director, Personnel



Lt. Col. Francis A. Farmer, Jr., B.A.  
Comptroller



Maj. John R. Mancus, B.S.  
Director, Administrative Services



Lt. Col. John L. Tibbitts, M.A.  
Director, Information



Capt. William G. Dwyer, B.A.  
Director, Materiel Support

## School of Engineering

### Nuclear Engineering Test Facility

## School of Systems and Logistics

## Civil Engineering Center

## Defense Weapon Systems Management Center

## Civilian Institutions Division

## Admissions

## Minuteman Education Program

## Library

meet specific Air Force requirements. This division also monitors the AFROTC graduates whose call to active duty has been postponed while they pursue graduate work at other than government expense.

The Institute has progressed from a non-degree- to a degree-granting institution, and during the period of this report 48 bachelors degrees and 285 masters degrees were conferred on graduates of the School of Engineering and the School of Systems and Logistics. More recently, a doctoral program in aerospace engineering was added to the curricula of the School of Engineering and students were entered in the initial class in June 1965.

When the engineering and test activities at McCook Field required more extensive facilities, they were moved in 1927 to a 4,500-acre tract of land donated to the government by the citizens of Dayton. The new installation

was named Wright Field in honor of Dayton's celebrated native sons, Orville and Wilbur Wright.

Shortly after Pearl Harbor, the school was forced to suspend classes. By that time it had graduated more than 200 officers, many of whom were the nation's foremost wartime and postwar leaders of aviation. In April 1944, the school was reopened so that a series of accelerated three- and six-month courses could be offered to meet emergency needs.

Following the cessation of hostilities in 1945, a survey was made of the educational achievements of the Army Air Force Officer Corps. The results indicated that there was a general lack of academic attainment within the Corps and that a need existed for improving its competence. Shortly after the survey was made, a board of officers was appointed by the Commanding General, Air Technical Service Command (ATSC), to study the problem.



## Aerospace Education-- A Tradition

The board recommended that the Army Air Force establish a technical school under the immediate supervision of the Commanding General, ATSC, and that the existing Army Air Force Engineering School be expanded to accomplish the recommended action.

Other surveys followed, and the recommendations were basically the same. As a result of these efforts, the Army Air Force Institute of Technology was officially opened on 3 September 1946 with a faculty of eight civilians and five officers and an enrollment of 189 officer students.

When the Air Force became an autonomous unit in the military establishment in 1947, the school was renamed the Air Force Institute of Technology. It was also at this time that Wright Field and neighboring Patterson Field were combined into one installation and given the name Wright-Patterson Air Force Base.

Command jurisdiction of the Institute was transferred from the Air Materiel Command to Air University on 1 April 1950.

AFIT's location, at a large center for aeronautical research and development and at the headquarters of Air Force materiel activity, has long been recognized for the many unusual opportunities it offers both students and faculty. The research laboratories and the scientists working in them, the logistical and professional personnel of the Air Force Logistics Command all provide the kind of

environment and atmosphere in which the students will ultimately be working. And the assignment of actual rather than hypothetical Air Force problems gives both students and faculty added advantages.

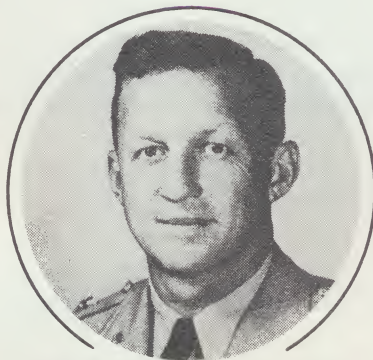
As technological and scientific research increased, a concomitant increase was noted in the need for more and better-educated base civil engineers. It was for this reason that the Civil Engineering Center was established in 1947. Its courses of study cover all phases of air base construction, operation, and maintenance, with emphasis on the technical, managerial, and administrative functions of the base civil engineer.

In developing professionally-qualified civil engineers who are responsive to Air Force needs, the center has added several integrated professional development programs, including a resident education program, a comprehensive nonresident study course, and a professional engineer registration program. It also publishes a professional journal for the Civil Engineering Utilization Field.

What began in October 1955 as an experimental six-month graduate logistics course led to the permanent establishment of the School of Systems and Logistics. The school, in cooperation with The Ohio State University, offers a 12-month graduate logistics program and a series of continuing education courses in logistics. Students who success-



Major General Grandison Gardner  
(July 1950 - January 1951)



Brigadier General Leighton I. Davis  
(January 1951 - October 1951)



Major General Ralph P. Swofford, Jr.  
(October 1951 - November 1955)





**Brigadier General Mervin E. Gross**  
(January 1946 - October 1946)



**Brigadier General Edgar P. Sorensen**  
(January 1947 - August 1948)



**Major General Laurence C. Craigie**  
(September 1948 - June 1950)

fully complete the 12-month program receive master of science degrees in logistics management.

Late in 1961 the Commander, Strategic Air Command (SAC), requested AFIT's assistance in planning an educational program for launch control officers at SAC's various Minuteman intercontinental ballistic missile sites. Such a program, it was pointed out, could attain two purposes: (1) serve to relieve the monotonous tension associated with launch control duties and (2) help meet the Air Force goal of providing a higher degree of education for its personnel without the necessity of excusing them from duty for one or two years to earn a degree on campus.

Considerable discussion followed the SAC commander's suggestion, and it was the consensus of all concerned that the plan was feasible and would be a valuable adjunct to the Minuteman missile defense system. The recommendation further stated that AFIT should be assigned the task of conducting the programs. Approval by Air Force Headquarters was given in April 1962.

AFIT inaugurated its first Minuteman program at Malmstrom AFB, Montana. It has since increased these programs to include Ellsworth AFB, South Dakota, Minot AFB, North Dakota, Whiteman AFB, Missouri, and Francis E. Warren AFB, Wyoming. The program at Malmstrom is under the supervision of

the School of Engineering; all others are monitored by the Civilian Institutions Division.

A recent acquisition of the Institute is the Air Force Nuclear Engineering Test Facility (AF NETF). In-house responsibility for this facility has been given to the School of Engineering. The NETF is an Air Force-directed and Department of Defense-supported project, and AFIT is responsible for developing its potential as a research and development tool and for its integration into the Air Force research and development inventory. Historically, the facility is an outgrowth of the Aircraft Nuclear Propulsion project. It is a 10-megawatt reactor, the seventh largest in the country, and the highest-powered reactor in the Department of Defense establishment.

The most recent addition to the AFIT structure is the Defense Weapon Systems Management Center. Established at Headquarters United States Air Force on 10 March 1964 by directive of the Secretary of Defense, it was transferred to Wright-Patterson Air Force Base in July of that year as a component of AFIT. Its mission is to provide an education program for senior military and civilian managers of major weapon systems.

A more detailed account of each of these academic organizations, including a review of their activities during the past year, is given in the following pages. ■ ■ ■



**Major General J. K. Lacey**  
(November 1955 - August 1957)



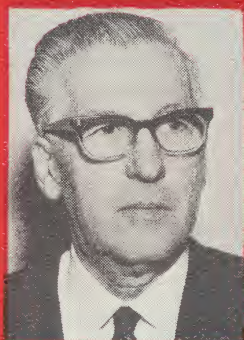
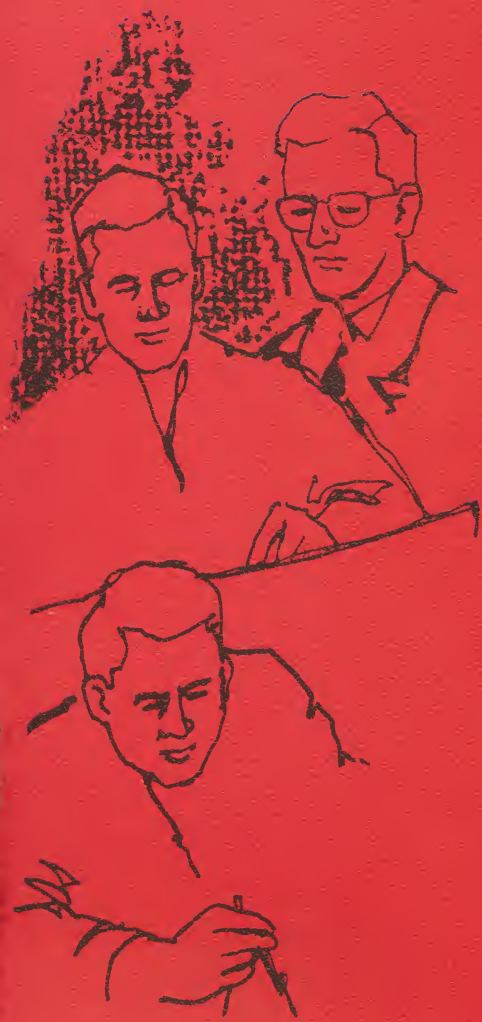
**Colonel John A. McCann**  
(April 1964 - November 1964)



**Major General Cecil E. Combs**  
(September 1957 - September 1965)



# School of Engineering



R. H. Downing, Ph.D.  
Dean



W. L. Lehmann, Ph.D., P.E.  
Asst. Dean, Research



Lt. Col. J. G. Crouch, M.S.E.  
Asst. Dean, Engineering



## Aeronautical Engineering

H. C. Larsen, M.S., P.E.



## Electrical Engineering

C. M. Zieman, Ph.D.



## Humanities

H. E. Hand, D.Ed.



## Mathematics

A. B. Carson, Ph.D.



## Mechanical Engineering

A. J. Shine, Ph.D.



## Mechanics

D. W. Breuer, Ph.D.



## Physics

L. S. Pedrotti, Ph.D.



## Systems Management

Col. W. W. Converse, Ed.D.



**B**y the end of the year, the faculty and staff had become settled in the new School of Engineering building, dedicated the previous August, and were enjoying the privilege of working in pleasant and attractive surroundings. More pleasure and satisfaction were derived, however, from the knowledge that the building was a symbol of faith and trust in their educational efforts.

In general, the year was a productive one for the School. It marked the graduation of the first class in the AFIT Minuteman Education Program (details on this are included in another section), the enrollment of the first class of students in the School of Engineering doctoral program, the incorporation of the Air Force Nuclear Engineering Test Facility (NETF) with the School of Engineering for a two-year experimental period, and achievement at the NETF of the first sustained nuclear reaction (criticality).

In February, a member of the Department of Aeronautical Engineering, Professor Peter Bielkowitz, was honored during National Engineers' Week when he was selected as one of ten outstanding engineers in the Dayton, Ohio, area. Selection of the men was based on their achievements in 1964 which contributed appreciably either to scientific knowledge and technological progress or to public welfare and safety. Professor Bielkowitz was recognized for a study he conducted at the request of the Warfare Systems School, Air University, which involved the ground tracking of 24-hour satellites in inclined elliptical orbits with various perigee positions and eccentricities.

The School of Engineering admitted its first doctoral candidates in June. Public announcement of the new program was made on 28 August 1964 during dedication ceremonies for the new School of Engineering building. At that time, Secretary of the Air Force Eugene M. Zuckert read a letter from President Johnson to General Combs, AFIT Commandant, in which the President congratulated the members of the Institute on the occasion of the dedication, and closed with the following words concerning the doctoral program:

*The establishment of a doctoral level program in the aerospace sciences, announced today by Secretary Zuckert, will expand, and strengthen, the important role of the Air Force Institute of Technology in our nation's defense program.*

*This program is in keeping with my recent remarks . . . , directing the Secretary of Defense to strengthen and broaden opportunities available to members of the military services to further their education while still in service.*

The doctoral candidates, 1 lieutenant colonel, 1 major, 7 captains, and 3 first lieutenants, will study at AFIT for two years. In that time they will complete all basic course work and qualifying examinations. They will then be assigned to an Air Force laboratory, filling regularly-assigned military spaces, where they will do research in an area of specific interest to the laboratory in which they are working. This research will provide the material for their doctoral dissertation. Throughout the period of their academic tour, both at AFIT and in the laboratory, they will be under the joint guidance of a laboratory scientist and a faculty adviser.

The first year of the curriculum provides academic course work in physics, mathematics, and mechanics. In the second year, each student will, to a large extent, specialize in his major area of interest. Limited course work to further increase the students' depth of understanding in their major fields will be encouraged while assigned to a laboratory.

The program is interdisciplinary in nature, and students completing the program and satisfactorily meeting the thesis requirements will be awarded the degree of Doctor of Aerospace Engineering.

The doctoral program is administered by a Doctoral Council of twenty AFIT faculty members and administrators, with the coordination of a Laboratory Council composed of one representative from each of the major laboratories at Wright-Patterson AFB. These Councils have the responsibility for selecting students, formulating program content, recommending laboratory assignments, and establishing policy.

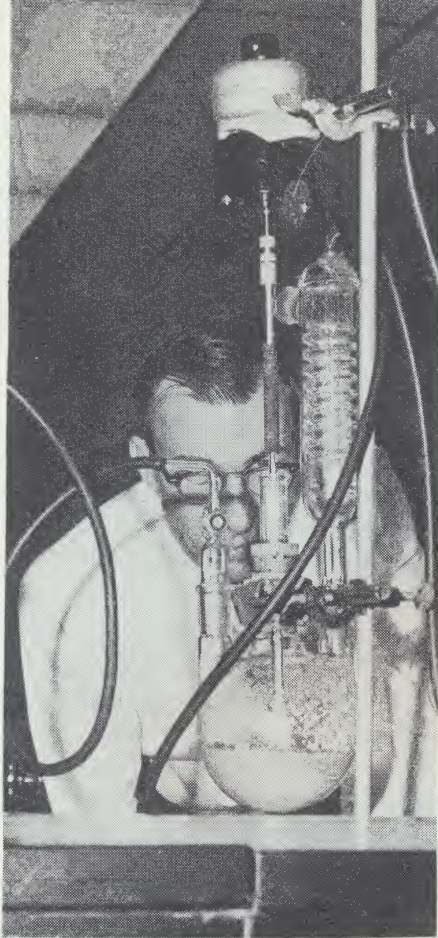


## School of Engineering

*Brigadier General Edward B. Giller, USAF Director of Science and Technology, addressing a graduate space physics class.*







Appropriate accreditation of the doctoral program was received from the North Central Association of Colleges and Secondary Schools following an inspection visit at AFIT by that Association in April 1965.

## Research

The Institute's research work is conducted primarily as an integral and essential part of graduate engineering education; however, every effort is made to insure that the total research capability at AFIT also supports the research and development activities of the Air Force. In faculty research, freedom of choice is maintained as an academic principle, and the interests and resources of on-base laboratories offer an excellent selection of areas from which to choose.

During 1965, the faculty actively participated in 60 research projects, prepared 75

research papers and 13 research technical reports for publication in professional journals, and delivered 22 research papers at professional scientific meetings. Twenty-three members of the faculty are conducting research on projects of specific interest to the following WPAFB laboratories: Aerospace Research Laboratories, Avionics Laboratory, Materials Laboratory, Flight Dynamics Laboratory, Aero-Propulsion Laboratory, and Aerospace Medical Research Laboratory.

Of the 232 students who were awarded masters degrees in 1965, 112 conducted the research for their dissertation under the sponsorship of an Air Force Laboratory. Work on the remaining 120 theses, all of which were Air Force oriented, was conducted at the Institute.

The School's research efforts are supported mainly by the laboratories of the Air Force



## School of Engineering



Systems Command and the Air Force Office of Aerospace Research. The AFIT School Shops render a specific service, however, by fabricating special items of equipment that either do not exist or cannot be purchased through base supply channels in sufficient time to be useful. This latter situation was improved somewhat this year when Air University initiated changes in the procurement procedures which now make it possible to secure supplies and equipment on a shorter time basis.

### Faculty Exchange Program

For several years, the School of Engineering has participated in a faculty exchange agreement with the College of Aeronautics, Cranfield, England. This arrangement has been enthusiastically supported by both Schools, and mutual benefits have accrued from this cross-feeding of ideas and from the opportunity to study the areas of research being pursued by the other School.

The members who participated in the exchange during the 1965 fall quarter were Professor J. J. Spillman of Cranfield and Major C. K. Grimes of the AFIT Department of Aeronautical Engineering.

### Professional Conferences

Two professional conferences were held at the School of Engineering during 1965—the Third Annual Student Conference of the American Nuclear Society (ANS) and the Conference on Matrix Methods in Structural Mechanics. Members of the AFIT student branch of the ANS and Dr. C. J. Bridgman, faculty adviser to students of the Graduate Nuclear Engineering Program, served as hosts for the ANS Conference held in April. Over 200 students and faculty members from 38 schools throughout the United States were in attendance. Of the ten awards given for the best papers presented, four were won by School of Engineering students.

The Conference on Matrix Methods in Structural Mechanics was co-sponsored by AFIT and the Air Force Flight Dynamics Laboratory (AFFDL). Co-chairmen of the



Conference were Colonel G. T. Buck, Director, AFFDL, and Dr. J. S. Przemienski, Professor of Mechanics, AFIT.

### Facilities

Modern equipment and facilities are as vital a part of effective teaching as is a competent faculty. AFIT's location, in the very center of the largest scientific, research and development, and logistics planning community in the country, provides access to a wide variety of the best and most modern scientific and logistics facilities available.

AFIT, however, does not rely completely on these on-base facilities, but has many excellent research and engineering laboratories which compare with, and often excel, those of its civilian counterparts.

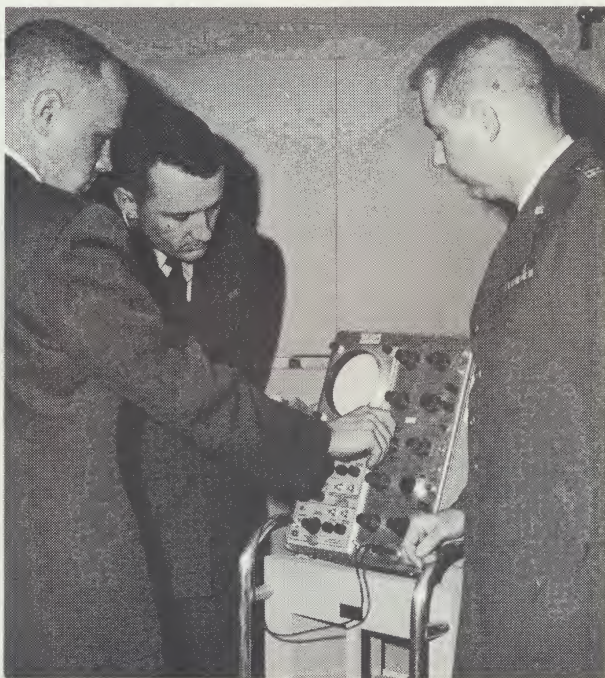
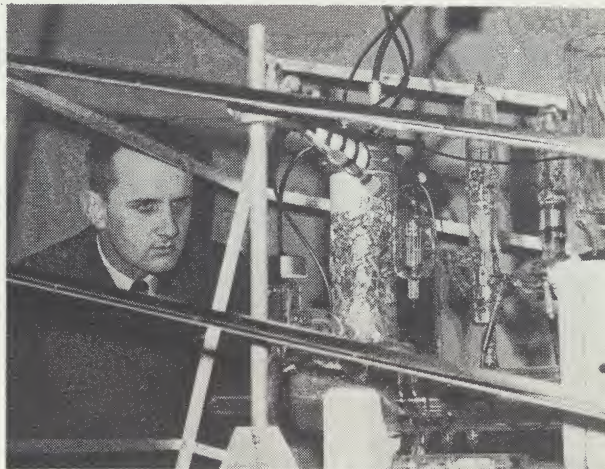
Additions to these facilities during 1965 included two Model TR-48 Solid State and two Model 231-R Non-Solid State Analog Computers. Two more TR-48s will be added in 1966. These computers replace older REAC equipment for instruction in analog computation, automatic control, and research. Also available is equipment for tie-in to the digital computer. A new vertical shock tube is under construction in the Mechanical Engineering Laboratory.

Equipment is on hand for assembly of a 4" x 19" transonic wind tunnel which will have a 6" x 6" interchangeable test section that will produce speeds up to Mach 3. When completed, sometime in 1966, it will be the only facility of its kind on WPAFB.

The Department of Mechanics is in the process of obtaining space simulators that will make it possible for the faculty and students to do research on materials and equipment under conditions similar to those on the surface of the moon or in space.

The addition of these facilities to those already a part of the School of Engineering, plus the scientific equipment and facilities available through other Air Force laboratories at Wright-Patterson, provides a scientific complex of almost unlimited potentials.

■ ■ ■





### NUCLEAR ENGINEERING TEST FACILITY



Col. J. R. Bohannon, Jr., M.S., P.E.  
Director

All actions required to insure successful prosecution of the Air Force Nuclear Engineering Test Facility (AF NETF) Project were completed on or ahead of schedule during 1965. The AF NETF is a recent acquisition of the Institute and as a research laboratory comes under the purview of the School of Engineering. It is an Air Force-directed and Department of Defense-supported project, and is an outgrowth of the Aircraft Nuclear Propulsion Program. A 10-megawatt reactor with all essential support facilities and equipment (hot cells, counters, computers, etc.), it is the highest-powered steady-state reactor in the Department of Defense, and it is the only Air Force research reactor operated by Air Force personnel.

The official AFIT-NETF assigned mission is stated as follows:

"To develop the potentials of the AF NETF to support research and development, including engineering and applied testing, and to integrate the facility into the Air Force scientific, engineering, and educational community as a new and diversified tool of investigation and inquiry."

The NETF and the services of its staff are available to individuals or agencies of the Air Force or Department of Defense, to their contractors, and to surrounding universities conducting programs in fulfillment of known or anticipated Air Force requirements. Many of these programs include laboratory projects conducted by AFIT students and faculty. In this capacity, it functions both as an educational and as a research tool.

The facility's development program began at the close of 1965 with the functional transfer of the NETF's personnel (formerly assigned to the Air Force Flight Dynamics Laboratory), equipment, and supply accounts to AFIT. The efficiency with which this transfer was handled and the successful completion of the final checkout of all equipment by the building contractors were a direct result of the conscientious and deliberate efforts of all parties concerned.

To date, experiments have been conducted in the NETF in such functional and disciplinary areas as activation analysis, biomedical research, solid-state device analyses, short-life isotopes, radiation effects, and materials development. Participants in these experiments include AFIT faculty and students, Aerospace Research Laboratories; United States Air Force Hospital, Wright-Patterson AFB; United States Atomic Energy Commission; Rome Air Development Center; Avionics Laboratory; Aero-Propulsion Laboratory; Texas Instrument Corporation; United States Army Electronic Command; and the University of Cincinnati.

The successful initiation of these experiments immediately following acceptance of the facility can be attributed to the promotional program conducted by the NETF's Engineering and Experimentation Division. This included the presentation of some 30 briefings to major Air Force laboratories and contractors; the procurement of formal endorsements and support from major air commands, laboratory directors, and other De-



partment of Defense agencies; the issuance of over 2,000 brochures; and communication with over 200 project engineers.

A number of key events lead to the present status of operation:

- Achievement of the first sustained nuclear chain reaction (criticality) at the NETF at 22:27 hours on 5 April,

- Accomplishment of full-core loading and initiation of a program of zero-power calibration and testing on 14 April,

- Approval to operate and maintain the NETF upon completion of a review of the Operations Plan (TR 65-3) and Technical Specifications (TR 65-6) by the Directorate of Nuclear Safety, Kirtland AFB, New Mexico,

- Certification of the qualifications of the checkout crew members by the contractor on 9 November,

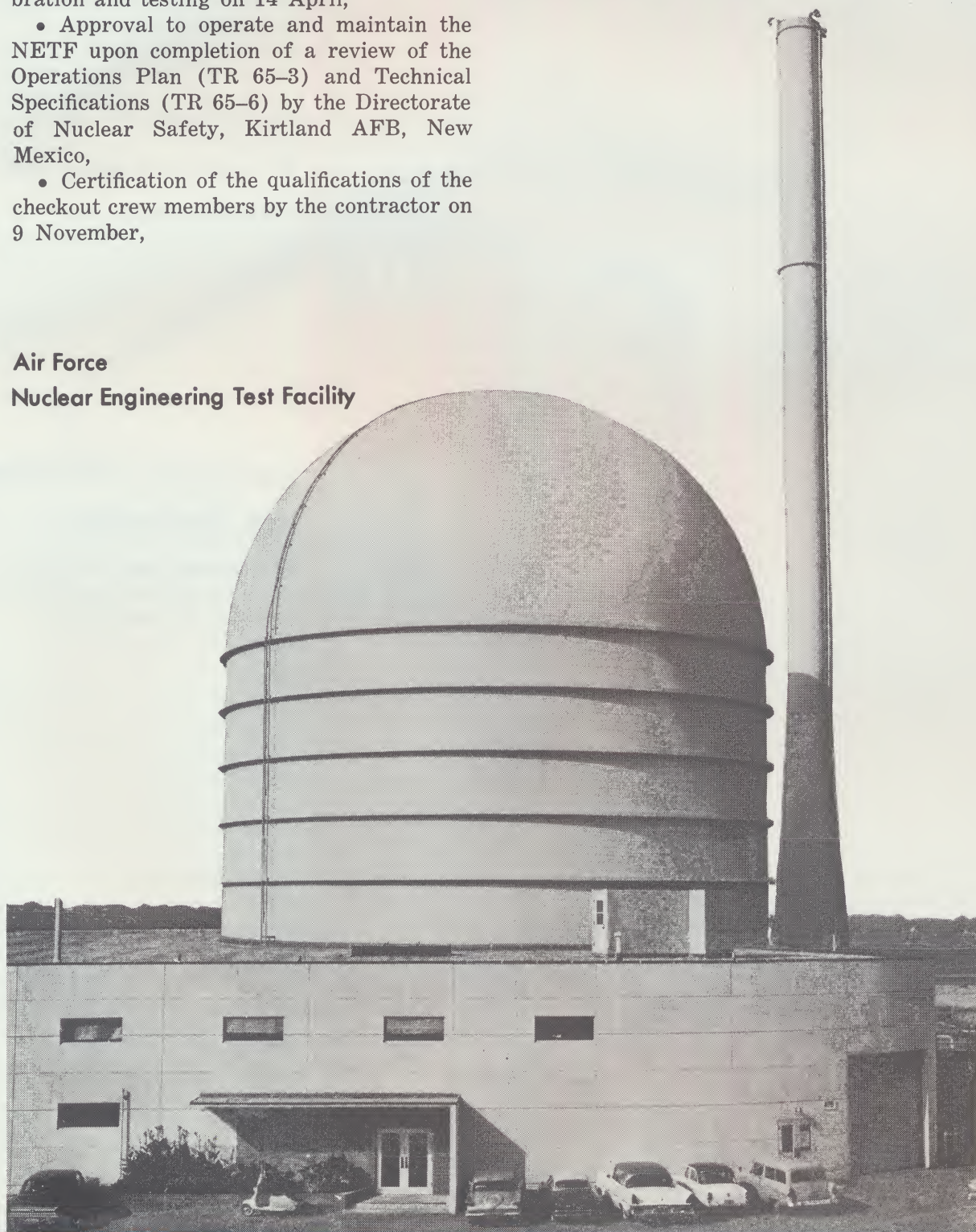
- Acceptance of the operational control of and safety responsibility for the NETF by AFIT on 9 November, and

- Transfer of the facility from the Corps of Engineers to the Air Force Institute of Technology.

On 1 January 1966, the Project Office will begin its two-year development program in accordance with its assigned mission and defined objectives. ■ ■ ■

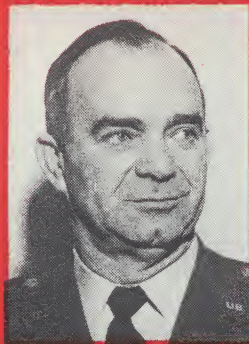
## Air Force

### Nuclear Engineering Test Facility





# School of Systems and Logistics



Col. C. A. Stone, Ed.D.  
Dean



## Graduate Education

Lt. Col. W. C. Thompson, Ph.D.



## Continuing Education and Curriculum

Col. R. W. Amick, M.S.





The waging of widespread counter guerrilla warfare in Southeast Asia under the most difficult circumstances has made for a host of logistical problems that do not lend themselves to conventional solutions. Response to this current challenge has resulted in the development of unusual procedures for the determination of logistical requirements, the replenishment of fighting forces in remote areas, and the maintenance of complex weapon systems far removed from supporting depots. Climate, terrain, and the nature of the conflict have compounded these problems. The human need is not only for competence in the ordinary sense, but also for a corps of logisticians who are imaginative and creative in devising new procedures, who are practical in their approach to emergencies, and who are able to apply scientific methods in the practice of their profession.

The School of Systems and Logistics is continually readjusting its curricula to meet the dictates of change. Throughout 1965, programs were expanded in scope to accommo-

date the ever-changing demands made on logisticians, and student enrollments were increased so as to provide more and better-equipped logistical personnel.

This increase in the school's academic and administrative workload made some measure of internal reorganization desirable. In order to improve operational efficiency, three directorates were created: Directorate of Graduate Education, Directorate of Continuing Education, and Directorate of Curriculum. The first is responsible for the accredited, 12-month degree-granting curriculum; the second is concerned with in-house short courses, but has supervisory responsibility for all programs conducted on sites other than Wright-Patterson AFB; and the third has responsibility for continually reviewing all course offerings to determine if they are timely and if they reflect the requirements of the organizations for which they are being given. Each directorate is headed by a director, who reports to the Dean, School of Systems and Logistics.



## Graduate Logistics Program

A Graduate Logistics Faculty Council began functioning in 1965. The Council is chaired by the Director of Graduate Education and normally meets once a week. The Council is empowered to discuss and resolve routine matters, to make policy recommendations to the Dean, School of Systems and Logistics, and to advise him on all matters affecting the Graduate Logistics Program.

The graduate logistics faculty, consisting of eleven full-time and four part-time instructors, was organized into four departments under the new Directorate of Graduate Education: Department of Quantitative Studies, Department of Management Studies, Department of Communicative Studies, Department of Research Studies and Publications. When fully staffed, the Department of Research Studies and Publications will have four scholars who will devote full time to logistics research and writing. If current plans develop, these four will have the added responsibility for editing and publishing a logistics periodical to be distributed in the near future by this school.

## School of Systems and Logistics

Graduation exercises for the Class of 1965 were held in joint ceremonies with the School of Engineering on 25 August. Of the 46 class members, 32 were from the United States Air Force, 7 from the United States Army, 4 from the United States Navy, and 3 from civilian agencies. Ten members of the class were graduated with distinction, having attained a grade point average of 3.75 or better. Each student received a logistics assignment following graduation.

A number of significant research papers were produced by the class as student theses. Thesis subjects were selected from existing logistics problems and the students' findings were sent to all interested field organizations.

The Class of 1966, composed of the full quota of 60 students, reported for processing on 19 August. The entering class was given an intensive five-weeks review in mathematics and English before starting their regular studies.

## Continuing Education Program

The increasing complexity of logistics and the more sophisticated logistical methods in use today have resulted in increased demands from the field for a program of continuing logistical education. To meet this need of the professional logistician, the School of Systems and Logistics established the Continuing Education Program, which consists of some forty short courses from one to fifteen weeks' duration. These courses are designed to provide continuing educational opportunities for managers in systems and logistics or in the functional areas of maintenance, supply, transportation, and procurement.

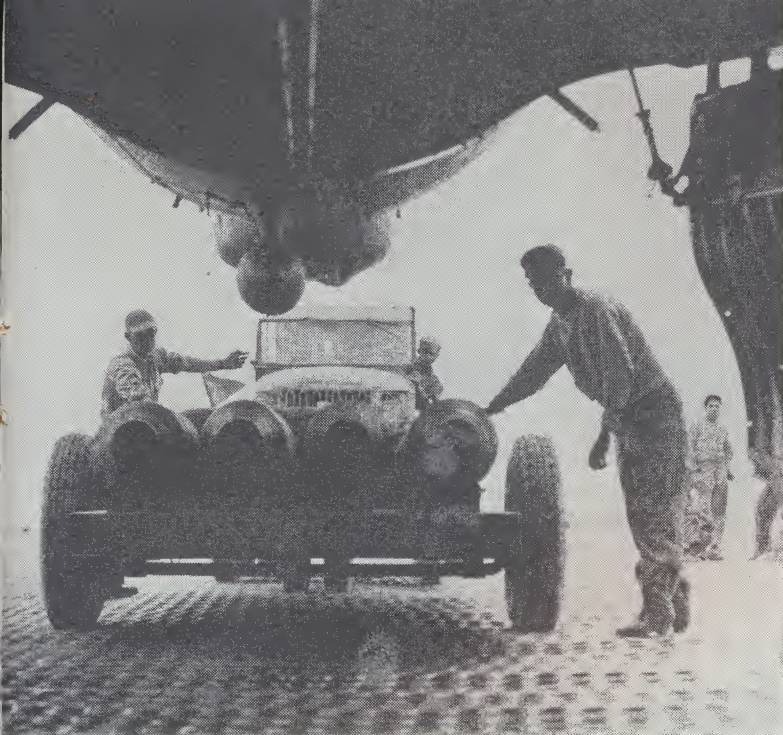
The size of this resident program has been governed by available living quarters and teaching space rather than by demand. Even under these limiting factors, however, the program has steadily increased year by year, and in its seven-year history, 18,835 students have received certificates of course completion.

Because there are literally thousands of military logisticians who, for one reason or another, will be unable to pursue resident courses, the Assistant Secretary of Defense directed in 1964 that this school establish a nonresident logistics management program. In response to this directive, a Department of Nonresident Studies was created in January 1965 and placed within the framework of the Directorate of Continuing Education. Three general types of nonresident programs are now either in the developmental or operational stage. They include correspondence courses, on-site courses (Zone of Interior and abroad), and international (Military Assistance Programs—MAP) courses. It should be explained that all on-site courses, both in the Zone of Interior and abroad, other than those taught for MAP, are furnished at the request of the receiving agency, and the cost of the instruction is funded by the School of Systems and Logistics. Courses taught in response to MAP's requirements are funded by that agency.

The correspondence courses are still in the developmental stage. The Air University Extension Course Institute, through agreement with the School of Systems and Logistics, will







prepare the "Logistics Management Seminar" as the first correspondence course to be offered. By the end of 1965, several chapters had been received and estimated completion date is 1 August 1966.

The Directorate of Continuing Education has been authorized an increase of six logisticians for its Department of Nonresident Studies to give it sufficient organic capability for writing other planned correspondence courses. These positions will be filled as soon as competent persons can be selected.

On-site instruction within the continental United States during 1965 was accomplished by personnel currently assigned to the Directorate of Continuing Education. Instruction in management of value engineering and defense contracting was given at 22 centers to Army, Navy, and Air Force personnel. Approximately 900 students were scheduled for the courses offered.

Maintenance and procurement courses were presented at various overseas bases in Germany, Hawaii, and Japan. One course presented at several overseas locations, Base Procurement-Base Civil Engineering, was offered with the assistance of personnel from the AFIT Civil Engineering Center.

Other overseas instruction has included a series of logistics management training courses for the Republic of Korea Air Force, and a number of courses relating to resources management for the Republic of China Air

Force. In October, a faculty member served as seminar moderator and lecturer for a management seminar conducted by the Turkish Air Force. A series of lectures on advanced management was presented in November to personnel attending the Philippine Air Force Command and Staff School in Manila.

Current plans for fiscal year 1967 include an expansion of the Graduate Logistics Program and some adjustments to the curriculum. Transportation will not be given as a course but its essential subject matter will be integrated in other courses. A course in logistics planning will replace transportation.

The student quotas for resident courses of the Continuing Education Program have been set by the Air Staff, United States Air Force, at 3,859 for fiscal year 1967, with this breakdown: Air Force-Oriented, 1,325; Air Force-Department of Defense, 1,568; and Non-Air Force, 966.

Development of correspondence courses within the Department of Nonresident Studies will probably begin in the fall of 1966. Eventually a majority of the correspondence courses will be prepared by the Department of Nonresident Studies and administered by the Extension Course Institute, Air University.

Responsibility for on-site courses in the continental United States will be transferred to the Department of Nonresident Studies after 1 July 1966. The Department of Maintenance, Supply, and Transportation, by the addition of 11 officers, will provide instruction for the maintenance courses, and will send traveling teams to each requesting base.

The Military Assistance Program will have a requirement for the training of an estimated 500 personnel during fiscal year 1967. Preliminary reports indicate a requirement to send mobile instructional teams to the Philippines, Australia, Vietnam, Korea, and Peru. Other countries are expected to request training items. A catalogue has been prepared to provide information on the expanded logistics management program for MAP countries.

Over-all, it is significant and worthy of especial note that the Directorate of Continuing Education will instruct more than 7,000 logisticians during fiscal year 1967. ■ ■ ■



# Civil Engineering Center



## Advanced Engineering

Lt. Col. R. D. Marlow, B.S. (CE), P.E.



Col. V. L. Hastings, M.S. (IE)  
Director



## Engineering Orientation

Lt. Col. H. B. Arnold, M.E. (CE), P.E.



## Nonresident Studies

E. E. Peer, B.S. (EE), P.E.



## Research Studies

Lt. Col. D. R. Woods, Ed.D., P.E.





If one word could adequately describe the operation of the Civil Engineering Center during 1965, it would probably be *expansion*. This word could, however, be aptly applied to the Center since its origin in 1948, when less than 100 officers were graduated that year. By contrast, over 900 officers and officer-grade civilians received instruction through AFIT resident and overseas courses in 1965.

When the Center was established in 1947 as the Air Installations Engineering Special Staff Officers Course its mission was to provide the training necessary to update the civil engineering knowledge of base installation officers. A broadening of the scope of base civil engineer duties and the requirement that the Center include instruction for installation engineering officers at all levels of command have made it necessary for the Center to make many changes in its curriculum since the original program was offered. To accommodate these requirements imposed by Headquarters United States Air Force and

various Air Force commands throughout the United States and overseas, the Center has increased its course offerings to eight: Base Civil Engineer, Executive Engineering, Nuclear Defense Engineering, Pavement Engineering, Control Center Management, Network Planning, Applied Engineering, and Cold Regions Engineering.

### Materials Testing Laboratory

A rearrangement of the Center's classrooms, made possible when the school was moved from one building to another, permitted the inclusion of contiguous space for a much-needed modern Materials Testing Laboratory. The original Laboratory, because of its remote location, was restricted to soils testing. In the first six months of operation, the laboratory supported not only students of the Civil Engineering Center but also personnel of the Air Force Logistics Command.





# Defense Weapon Systems Management Center



Col. J. H. Harris, M.S.E.  
Commandant



Activities at the Defense Weapon Systems Management Center (DWSMC) were appropriately summarized by the Honorable Robert H. Charles, Assistant Secretary of the Air Force, in his address to the Center's graduates on 10 December 1965.

"I don't have to tell you that the scientific and technological, as well as the economic and industrial, aspects of national security are in an era of revolution. Since World War II, and particularly during the past decade, the Department of Defense has had to develop new management techniques and attitudes to match this revolution. Beginning with the management system, set up to bring the ICBM into operation, and later the Polaris, the system/project manager device has evolved to the point where it has been accepted and adopted throughout the Department of Defense—and in other agencies as well—to handle the larger and more complex acquisition programs.

"The presence in this class of students from all the military services as well as from the National Aeronautics and Space Administration, the Federal Aviation Agency, Canada, and defense industries, attests to the increasingly widespread use of this management technique. The old tried-and-true methods of management have been replaced by new tools and techniques. Defense managers now use such terms as systems analysis and simulations. Any meeting of systems managers now includes the dropping of such phrases as critical path analysis, PERT, real time, and information retrieval."

Presentation of new management techniques and of the language changes that result therefrom is, of course, the primary mission of DWSMC. One of the newest techniques has an innovator in Mr. Charles himself, who states in a later portion of his address:

"You may have heard of the *total package* concept with which we are experimenting on the C-5A program and which, if successful, we intend to apply to other programs such as SRAM. Stripped to its essentials, the total



package plan is intended to permit the awarding of contracts competitively, where performance and schedule are related to cost, and *on a basis of total responsibility*. These are the key words. But we in the government have for many years been living in an atmosphere of cost-plus and sole source, where more controls by the customer are needed; and this relinquishment of authority will, for many, be a shocking experience. But it must be done if we are to get the best results—performance, schedule, and cost—from our industrial partners, and you are the ones who will have to do it.”

As Mr. Charles emphasized, competition is the purpose behind this development of the total package concept which, although still in the experimental stage, is finding many applications, some of which are used as the basis of lectures and case studies in the DWSMC curriculum. Besides the Air Force's C-5A and SRAM, the Navy equivalent of the total package concept has been used with the A-7A and the OV-10. In the Army, a likely candidate is LOH Avionics.

The authority for DWSMC to provide a total education package in systems management was established in Air Force Regulation 53-9.

### Future Plans

In addition to the current Senior Resident Course, DWSMC is preparing plans for becoming a Center in the true sense of the word. These plans include offerings of resident and non-resident short courses in such subjects as cost estimating, configuration management, and integrated logistics support. A correspondence course is already under way. Seminars, publications, and research of new techniques should establish DWSMC as an institute of systems management.

In a discussion of the Navy's philosophy of project management, Vice Admiral I. V. Galantin, Chief of Naval Material, made the following statement:

“No one knows better than I do the urgent necessity for an immediate increase in the

numbers of men who are thoroughly qualified to occupy key positions in project management. I know also that the other services and other branches of the government similarly have pressing need for people who can categorically take control of a project and say ‘I can do the job.’”

Preparing selected military and civilian personnel of all Department of Defense components to meet that need is the responsibility of DWSMC, for it is here that they are trained in the effective management of programs concerned with the development, acquisition, and integrated logistic support of weapon and support systems. In carrying out its mission, the Center stresses the identification and solution of typical systems/project management problems, and offers a program of instruction that is closely allied with actual rather than hypothetical problems.

### Prime Objective

Because the Center's prime objective is to maximize its service to the military departments, its faculty consists of commissioned officers from the Army, Navy, and Air Force. Selection is based on their academic backgrounds and the managerial skills they have acquired through recent assignments involving systems development and acquisition management.

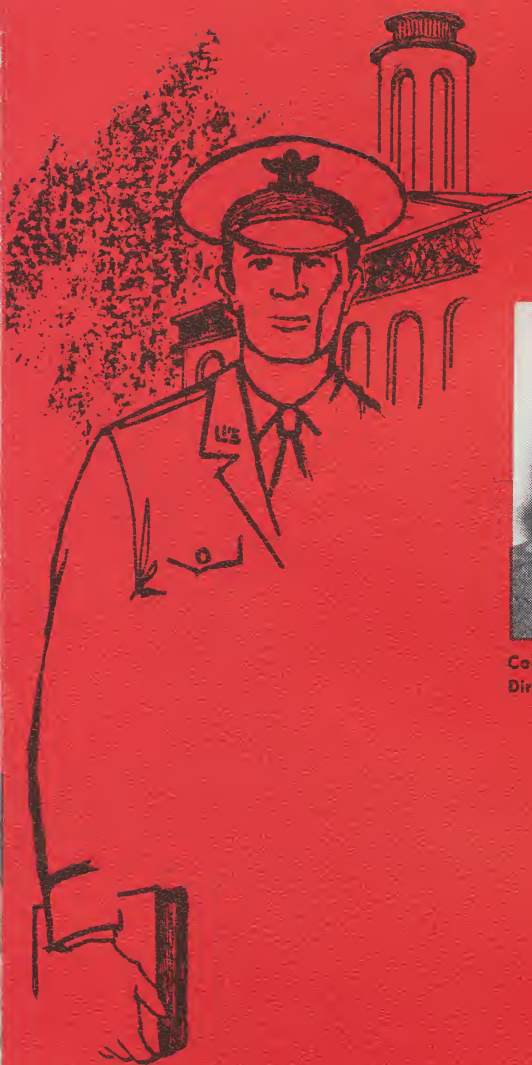
The program offered by the Center is presented by means of lectures, seminars, case studies, and exercises. The faculty is augmented by visiting lecturers representing line and functional specialties concerned with systems/project management. An important faculty contribution is made by The Ohio State University Research Foundation.

Although the Defense Weapon Systems Management Center has been in existence for only a short time, its graduates are rapidly making their presence known. And with the realization of the planned expansion of the Center's capability to conduct research in weapon systems management concepts and practices, future graduates should make even greater contributions in this field.





# Civilian Institutions Division



Col. M. R. Palmer, M.A.  
Director



## Scientific Education

Lt. Col. E. B. Sherrill, B.S.



## Professional Education

Lt. Col. T. E. Hopper, M.B.A.



The Civilian Institutions Division is charged with the responsibility of providing education and training programs at civilian colleges, universities, research centers, hospitals, and industrial organizations to meet specific Air Force education requirements. The programs involved in the fulfillment of this mission range from short courses varying from 1-13 weeks to doctoral programs for officers which may require as long as three years for completion of requirements for the degree. Most degree programs are the regular college curricula with little variation. A few are partially tailored to meet special Air Force requirements. Examples in this category are the Applied Comptrollership Program at Michigan State University and Research and Development Management Programs at the University of Chicago, Rensselaer Polytechnic Institute, and the University of Southern California.

Other specialized requirements include the preparation of military personnel for assignments as instructors at the Air Force Acad-

emy and the Air Force Institute of Technology; undergraduate, graduate, postdoctoral, and resident programs for medical personnel assigned to the Surgeon General's office; and undergraduate and graduate education for foreign officers studying under the Military Assistance Program. Under the Airman Education and Commissioning Program, qualified airmen pursue undergraduate curricula as a prerequisite for commissioning through the Officer Training School. This division monitors the education programs of all graduates of the Air Force Reserve Officer Training Corps (AFROTC) who obtain a delay of entry to active duty for the purpose of earning a graduate degree at their own expense. These students are referred to as Category "C" Delay Reservists. Also monitored are the programs of Air Force officers who are permitted to study under scholarships and fellowships granted by civilian colleges, universities, and foundations.

This division also has supervisory responsibility for five of the six Minuteman Education





Programs located at bases of the Strategic Air Command. A discussion of this program is included as a separate part of this report.

Through its civilian institutions programs the Institute maintains close contact with civilian colleges and universities and gains first-hand knowledge of their developments in academic subjects of special interest to the Air Force. This relationship provides AFIT with greater flexibility in meeting its educational requirements, and also provides the opportunity for timely exchange of ideas with educational leaders as a means of evaluating and strengthening all programs offered by the Institute.

The Training-With-Industry program provides the Air Force with a vast source of management and engineering educational experience unobtainable in any other manner. Officers with undergraduate or graduate degrees in engineering or business are provided an opportunity to gain knowledge of the management structure, engineering and produc-

ings, and availability for entry as determined by current Air Force mission requirements form the basis for determining their eligibility.

### Program Control

Each student's program is controlled by his faculty adviser (a company coordinator for TWI students), and by the program monitor in the Civilian Institutions Division. The program monitor must approve the student's initial education plan and any changes to it. Most of the program monitors are recent graduates of an AFIT program and all are fully qualified in the academic areas they monitor. Contacts with students are maintained by staff visits, correspondence, and telephone, and by the use of a monthly publication entitled *Contact*. One of the students at each institution is designated as Liaison Officer, and he is responsible to the Commandant, AFIT, through the Director, Civilian Institutions Division, for the control of all other students attending the same institution. Administrative functions of the Liaison Officers are accomplished with the assistance of Professors of Aerospace Studies at colleges and universities and Company Coordinators at industries, as appropriate.

### Scope of Education

Currently, 3,480 officers and 743 airmen are enrolled in 97 colleges and universities in the United States, in 10 foreign universities, in 26 industries, and in 93 hospitals. Although such programs as medical, Air Force Academy and AFIT instructor, scholarship, and the Distinguished Military Graduate Program of AFROTC require the use of many universities, 82 per cent of the officers in the regular AFIT quota programs are enrolled in 29 colleges and universities, and 90 per cent of the airmen are enrolled in 14 colleges and universities.

### Program Trends

During 1965, a sharp decline occurred in the number of officer students enrolled in engineering degree programs, decreasing from an

tion methods, and contracting procedures used by major industries in fulfilling Air Force requirements for the development and production of weapon systems and the provision of various kinds of special products and services.

### Selection of Students

Participation in civilian institutions programs is on a voluntary basis for both officers and airmen. Quotas are established by Air Force Headquarters. The AFIT Admissions Division determines the academic eligibility of all students and selects airmen for the Airman Education and Commissioning Program. Selection is based on the airman's academic performance and a review of an evaluation of his potential as an Air Force officer as contained in a board report from his local command. Officers are selected for the program by an Air Force Selection Board. Academic backgrounds, officer performance rat-

## Civilian Institutions Division





enrollment of 974 as of 1 January 1965 to 477 as of 1 January 1966. This downward trend can be attributed primarily to a major reduction in quotas in undergraduate engineering and an equally critical reduction in the availability of officers for graduate engineering programs because of increased Air Force mission requirements world-wide.

By contrast, during this same period, a marked increase was noted in the number of officers enrolled in masters degree programs in management—from 310 as of 1 January 1965 to 560 as of 1 January 1966. This increase was possible because of the availability of a greater number of academically-qualified officers.

The Training-With-Industry program has grown from 23 quota spaces in 1947 to its present quota of 150 spaces for fiscal year 1966. However, because of priority mission requirements, only 92 officers were made available for attendance in the 1966 program. In the absence of any change in these requirements, this program can be expected to remain at or slightly above the current level of participation.

The Category "C" program has shown a marked increase in enrollments during the past year. Currently, there are 1,279 officers in the program, the highest enrollment since the program began. A probable increase in the ceiling for Air Force officers and the need for increased numbers of junior officers should bring about a substantial reduction of Category "C" officers within the next year.

The Airman Education and Commissioning Program with an annual input of 400 airmen and a continuing enrollment of approximately 800 is expected to remain at current levels.

### Degree Attainment

The number of officers receiving degrees from civilian institutions in fiscal year 1965 reached an all-time high in the fields of engineering, biophysical sciences, and management. Distribution of these degrees by academic field and degree level was as follows:

<i>Academic Field</i>	<i>Degree Level</i>			<i>Total</i>
	<i>B</i>	<i>M</i>	<i>D</i>	
Engineering	415	356	20	791
Biophysical Sciences	53	141	20	214
Management	14	248	3	265
Totals	482	745	43	1,270

As indicated in the earlier discussion of declining officer enrollments, the number of officers receiving degrees in engineering and biophysical sciences will be reduced by approximately 50 per cent in fiscal year 1966. On the other hand, the number of officers receiving degrees in management in fiscal year 1966 should increase approximately 33 1/3 per cent. During fiscal year 1965, airmen in the Airman Education and Commissioning Program earned 183 degrees in engineering, 40 in the biophysical sciences, and 103 in management. All degrees were at the baccalaureate level. Since airman enrollment is expected to remain near current levels, the number receiving degrees in these fields in fiscal year 1966 is estimated to be approximately the same as in fiscal year 1965. ■ ■ ■



# Admissions



H. E. Lillie, M.A.  
Director

Since field counseling services are considered the most effective means of acquainting Air Force personnel with the educational opportunities available through AFIT, the Admissions Division expanded this operation during 1965. Periodically, staff members made presentations to AFROTC groups, to students at the Squadron Officer School, and to officers and airmen stationed at bases throughout the continental United States. They also visited twelve overseas bases in the Pacific Air Command. Base commanders and their staffs were extremely cooperative in providing adequate publicity in advance of these visits to insure maximum participation by interested individuals. The Institute is grateful for their support.

During the visits of the field counselors, group briefings were given on the officer and

airman programs, and interested personnel were encouraged to submit an AFIT application for evaluation. They were also offered the opportunity to discuss their applications in individual interviews at the end of the briefings. After an application is received at AFIT and evaluated, the applicant is advised of his eligibility to pursue an AFIT program. If he is not eligible, he is informed of the action he must take to meet the necessary academic prerequisites.

Of the 400 quota spaces available in the Airman Education and Commissioning Program for fiscal year 1966, less than 40 remain for which an applicant has not been selected or identified. As in past years, the most difficult quotas to fill are those in engineering, meteorology, and photographic science. There are strong indications that at least half of the 40 remaining spaces will be filled by 15 March 1966, at which time any remaining spaces will be converted to other academic fields and filled from applications on hand. It is of interest that 175 formal applications are currently on hand, 66 per cent of which are for nontechnical fields for which no fiscal year 1966 spaces remain. The other 34 per cent are for technical fields and were submitted by applicants who are not yet academically qualified but are currently enrolled in additional course work. During the first half of fiscal year 1966, 698 requests for evaluation were received; 425 letters of eligibility were issued; and 297 formal applications were accepted. The fiscal year 1967 quotas have been established and are essentially identical with those for fiscal year 1966. The Airman Education and Commissioning Program Selection Committee will start filling these quotas on a continuous basis in late April 1966 from applications on hand and periodically thereafter from applications as they are received.

Substantial progress was made during this period in the Institute's efforts to update the records of the Academic Transcript Repository. The Repository contains a collection of the academic transcripts of all Air Force officers who are eligible for consideration for AFIT programs. Eligible officers are those



with twelve years or less of total active federal military service. In the initial establishment of the Repository, which was a joint effort of Headquarters United States Air Force, Headquarters Air University, and AFIT, transcript summaries were prepared from each officer's academic record and this information was transferred to electronic tapes for use on computers at Air University. The immediate availability of this information makes it possible to communicate directly with officers about their future educational desires and, where interest is indicated, permits the long-range planning for placing the officers in school.

During 1965, 17,157 transcripts were received for evaluation in the updating project, and the academic records of 27,421 officers were added to the Repository. In conjunction

with this project and others, an evaluation was made of the educational achievements of 37,792 officers to determine grade point averages, academic specialties, colleges attended, and degrees received. A more extensive review was made of the records of 2,577 officers in the compilation of educational summaries for use by the Air Force Headquarters Committee on AFIT Selections in considering fiscal year 1967 applicants.

The lack of officers who could be declared eligible to fill educational quotas in technical fields continued to be a matter of great concern to this organization. The reverse was true, however, in the nontechnical fields; consequently, the number of qualified applicants outnumbered the spaces available for fiscal year 1966 and resulted in intensive competition for these positions. ■ ■ ■







# Minuteman Education Program

Readers of the 1964 Commandant's Annual Report may recall that education programs are being provided at Minuteman Missile bases in the Strategic Air Command (SAC) for the purpose of relieving the monotony and tension associated with the duties of a Launch Control Officer (LCO) and of providing them the opportunity to advance their educational level during their tour of duty. To date, Minuteman Education Programs have been established at five Strategic Air Command bases and a sixth program is scheduled to begin in July 1966.

The first program was established at Malmstrom Air Force Base, Montana, by the School of Engineering in September 1962 and provided an LCO the opportunity to obtain a master of science degree in aerospace engineering. Sixteen officers in this program received their degrees in October 1965, an additional 22 will receive degrees in January 1966, and the remainder are scheduled to graduate by September 1966. A rather high attrition rate has been experienced at Malmstrom due primarily to problems associated with the development of Malmstrom as the first operational Minuteman base. However, the need for such a program and the feasibility of presenting it have been proven. In fact, a second-cycle program has begun at Malmstrom for replacement crew members. Participants in this second cycle, depending on their academic backgrounds, will receive the master of science degree in aerospace engineering at Malmstrom or will complete a sufficient number of courses to enable attainment of a degree in residence at the School of Engineering subsequent to completion of their tour of duty as Launch Control Officers.

Minuteman Education Programs supervised by the Civilian Institutions Division and presented under contract with a civilian university include a master of science degree program in industrial management at Minot AFB, North Dakota, offered by the Univer-



**A**s we review our experiences during the past year, we quickly note the many areas in which truly noteworthy progress has been made. We observe also that at times our plans had to be adjusted to coincide with the urgent demands thrust upon our nation because of its dominant role of leadership in world affairs. This adjustment has presented challenges to our often-demonstrated versatility in accomplishing our purpose—that of providing education to members of the Air Force as set forth in our mission requirements. As we try to envision the future, we are aware that these challenges will continue, and, in all sincerity, we would not have it otherwise, for challenge is the backbone of progress.

Although my tenure at AFIT has been of relatively short duration, I have become extremely conscious of the accomplishments of my most able predecessor, Major General Cecil E. Combs, and of the wonderful support he has received from the faculty and staff. And as I review these achievements, I experience a great sense of admiration for an organization that is able to fulfill its mission so capably while adjusting to changing situations.

The most serious problem has been the difficulty the Air Force has encountered in identifying a sufficient number of technically-qualified officers who can be made available to fill the educational quotas in science and technology. This is due to a number of reasons, but is, of course, conditioned greatly by the conflict in Southeast Asia. If previous predictions of Air Force needs are valid, this could develop into a shortage of potential students for these critical engineering and scientific specialties. As a partial remedy to the situation, AFIT is attempting to develop a means for redirecting the education of officers with baccalaureate degrees in nonscientific fields and for providing refresher and up-dated courses for officers lacking sufficient grades to enter graduate scientific and engineering programs. AFIT's major effort in this direction will be in the School of Engineering where frequently-tested flexibility exists.

The shortage of available officers in critical areas also had an adverse effect on programs monitored by the Civilian Institutions Division. These programs provide for college education for Air Force officers through

*. . . a welcome to the new Commandant . . . a master's degree to an Air Force officer*





regular college-degree programs in civilian educational institutions. Here, also, a reduction in enrollment was especially heavy in the engineering field where the drop was over 50 per cent. However, this was counter-balanced somewhat by an increase in the number of enrollees in management programs.

The Minuteman Education Program is an example of AFIT's capability for establishing programs on short notice to meet Air Force needs and contingencies. This program is

spite of the unexpected initial attrition rate, which resulted from reasons other than scholastic aptitude, the Malmstrom program is clearly a success.

The new doctoral program offered by the School of Engineering marks AFIT's entrance into the highest level of academic endeavor. United States Air Force approval to offer a doctor of engineering science program and appropriate accreditation by the North Central Association of Colleges and Secondary Schools preceded enrollment of the initial class of twelve.

Further evidence of maturity and growth were shown by the strengthening of our mutual faculty exchange program with the College of Aeronautics at Cranfield, England; the hosting of an international conference on structural mechanics sponsored by the School of Engineering's Department of Mechanics; and the hosting of the annual student conference of the American Nuclear Society by the AFIT chapter of the ANS. The visiting lecturer's program, generally in the humanities, has been augmented by a scientific lecture series hosted by the AFIT Sigma Xi Club and sponsored by the Air Force Office of Aerospace Sciences.

The activation of the Air Force Nuclear Engineering Test Facility (AF NETF) and

## The Year in Review

described in detail in another part of this report. However, I would like to note here that AFIT has activated five programs at various Minuteman missile sites since 1962 and is preparing to inaugurate a sixth in July 1966 at Grand Forks Air Force Base, North Dakota. One cycle at Malmstrom Air Force Base, Montana, and the first to be activated, has been completed, and students of this first group were awarded masters' degrees in aerospace engineering in the fall of 1965. In





its acceptance by AFIT as an Air Force research laboratory present another avenue of opportunity through which the Institute may be of service to the United States Air Force. An extensive research program is planned for the NETF, and the work that has been accomplished toward its fulfillment indicates attainment of a high level of achievement.

The School of Systems and Logistics continued to grow and to develop new offerings to meet Air Force requirements. This was particularly noticeable in the continuing education courses, where course offerings were revised, added, or deleted as dictated by the requirements of the using commands. The limitations on resident enrollments in the continuing education courses are those imposed by housing at Wright-Patterson AFB rather than by demand from the using agencies. In order to alleviate this restriction to some extent, but more importantly to provide education when and where it was needed, many short courses were given on site at bases in the United States and overseas. AFIT's activity in on-site work is growing and is further manifestation of our endeavor to meet validated educational needs wherever and whenever we are capable of doing so.

The concept of providing continuing education programs on site emerged as a new

and important contribution of the Civil Engineering Center, particularly in Southeast Asia where new problems of construction became the order of the day.

The new and distinctive program in Defense Weapon Systems Management, sponsored by the Department of Defense, is rapidly proving its effectiveness. Although all AFIT organizations accept enrollees from the other services, the Defense Weapon Systems Management Center is specifically established for this purpose. The wholehearted cooperation provided by the many experts from the services, from the Department of Defense, and from industry who participate as lecturers provide an up-to-date fount of knowledge of inestimable value.

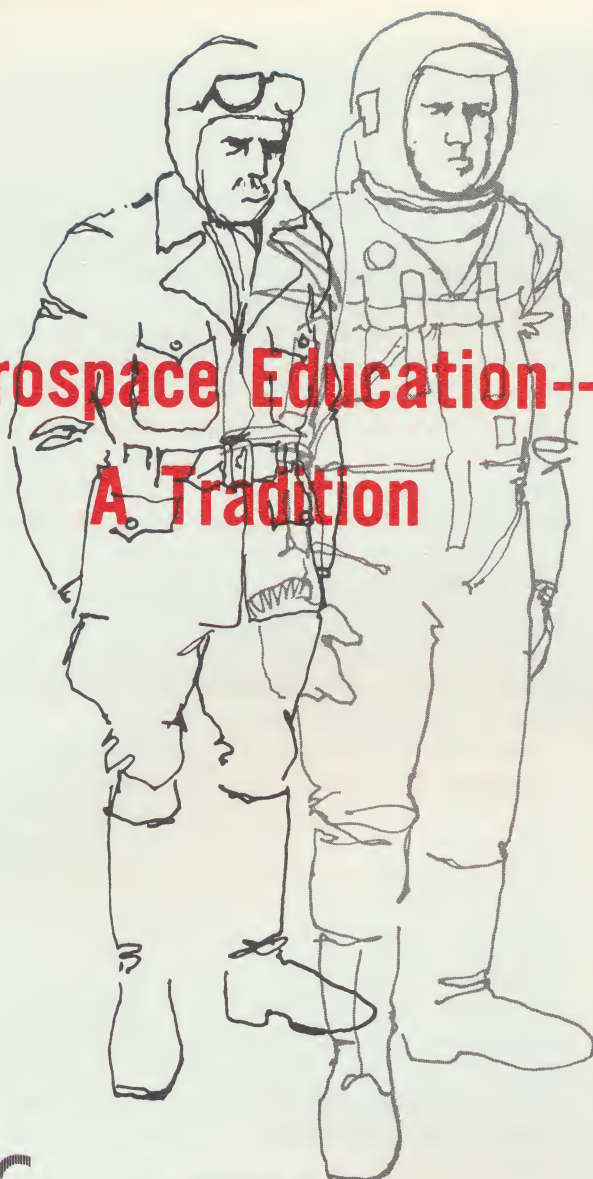
As the year's activities are reviewed in retrospect, it is amazing to note the growth in the size and scope of the operation over that of a few years ago. The fact that over 15,000 students were enrolled in AFIT programs during fiscal year 1965 would seem to prove that the faculty and staff have been successful in their constant efforts to improve the quality of their work and to adjust their methods of operation to ever-changing conditions. The extension of AFIT's influence further attests to its ability to meet Air Force educational requirements at the highest level.

■ ■ ■



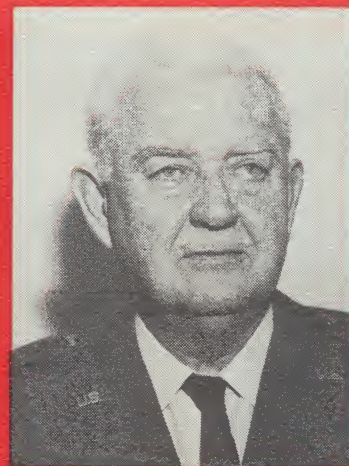


# Aerospace Education-- A Tradition

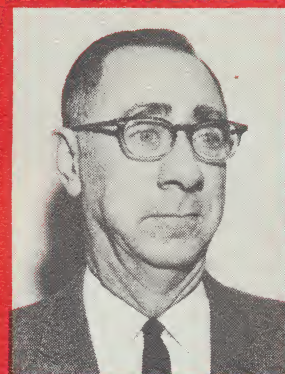


Concurrent with the forging of aerospace power, there emerged a new breed of fighting men. These men recognized the dynamic capabilities of aerospace vehicles, and their pioneering work in observation balloons, blimps, DHs, and Jennys fired their imaginations. Being both visionaries and realists, they sought to accelerate the development of an air vehicle that would fly faster, further, and more safely. They felt that the answer lay in technical education.

Among the first schools specializing in aeronautical engineering was the Army's Air School of Application, which was established at McCook Field, Dayton, Ohio, in 1919. This school, the predecessor to the Air Force Institute of Technology (AFIT), was placed under the command of Colonel Thurman H. Bane, who conceived the original idea of an aeronautical school within the Army. With a student enrollment of seven officers and a faculty



Col. John A. McCann, M.A.  
Deputy Commandant



Howard W. Barlow, Eng. Sc.D., P.E.  
Academic Director

composed of engineering specialists assigned to McCook Field, the school held its first class in November.

Through the years the school has grown both in stature and in enrollment and has taken a prominent position in the academic community. An expansion of its resident facilities now includes a School of Engineering, School of Systems and Logistics, Civil Engineering Center, and Defense Weapon Systems Management Center.

In addition to its resident programs, AFIT, through its Civilian Institutions Division, monitors the academic programs of some 4,500 officers and airmen attending civilian colleges, universities, hospitals, and industrial organizations located throughout the United States and overseas. Responsibility for this program was delegated to AFIT in August 1947. These programs, which include degree and nondegree at all levels, are designed to





Col. Charles W. Sampson, M.S., P.E.  
Director, Programs



Lt. Col. Thomas L. Parella, M.A.  
Director, Personnel



Lt. Col. Francis A. Farmer, Jr., B.A.  
Comptroller



Maj. John R. Mancus, B.S.  
Director, Administrative Services



Lt. Col. John I. Tibbits, M.A.  
Director, Information



Capt. William G. Dwyer, B.A.  
Director, Materiel Support

## School of Engineering

### Nuclear Engineering Test Facility

## School of Systems and Logistics

## Civil Engineering Center

## Defense Weapon Systems Management Center

## Civilian Institutions Division

## Admissions

## Minuteman Education Program

## Library

meet specific Air Force requirements. This division also monitors the AFROTC graduates whose call to active duty has been postponed while they pursue graduate work at other than government expense.

The Institute has progressed from a non-degree- to a degree-granting institution, and during the period of this report 48 bachelors degrees and 285 masters degrees were conferred on graduates of the School of Engineering and the School of Systems and Logistics. More recently, a doctoral program in aerospace engineering was added to the curricula of the School of Engineering and students were entered in the initial class in June 1965.

When the engineering and test activities at McCook Field required more extensive facilities, they were moved in 1927 to a 4,500-acre tract of land donated to the government by the citizens of Dayton. The new installation

was named Wright Field in honor of Dayton's celebrated native sons, Orville and Wilbur Wright.

Shortly after Pearl Harbor, the school was forced to suspend classes. By that time it had graduated more than 200 officers, many of whom were the nation's foremost wartime and postwar leaders of aviation. In April 1944, the school was reopened so that a series of accelerated three- and six-month courses could be offered to meet emergency needs.

Following the cessation of hostilities in 1945, a survey was made of the educational achievements of the Army Air Force Officer Corps. The results indicated that there was a general lack of academic attainment within the Corps and that a need existed for improving its competence. Shortly after the survey was made, a board of officers was appointed by the Commanding General, Air Technical Service Command (ATSC), to study the problem.



## Aerospace Education-- A Tradition

The board recommended that the Army Air Force establish a technical school under the immediate supervision of the Commanding General, ATSC, and that the existing Army Air Force Engineering School be expanded to accomplish the recommended action.

Other surveys followed, and the recommendations were basically the same. As a result of these efforts, the Army Air Force Institute of Technology was officially opened on 3 September 1946 with a faculty of eight civilians and five officers and an enrollment of 189 officer students.

When the Air Force became an autonomous unit in the military establishment in 1947, the school was renamed the Air Force Institute of Technology. It was also at this time that Wright Field and neighboring Patterson Field were combined into one installation and given the name Wright-Patterson Air Force Base.

Command jurisdiction of the Institute was transferred from the Air Materiel Command to Air University on 1 April 1950.

AFIT's location, at a large center for aeronautical research and development and at the headquarters of Air Force materiel activity, has long been recognized for the many unusual opportunities it offers both students and faculty. The research laboratories and the scientists working in them, the logistical and professional personnel of the Air Force Logistics Command all provide the kind of

environment and atmosphere in which the students will ultimately be working. And the assignment of actual rather than hypothetical Air Force problems gives both students and faculty added advantages.

As technological and scientific research increased, a concomitant increase was noted in the need for more and better-educated base civil engineers. It was for this reason that the Civil Engineering Center was established in 1947. Its courses of study cover all phases of air base construction, operation, and maintenance, with emphasis on the technical, managerial, and administrative functions of the base civil engineer.

In developing professionally-qualified civil engineers who are responsive to Air Force needs, the center has added several integrated professional development programs, including a resident education program, a comprehensive nonresident study course, and a professional engineer registration program. It also publishes a professional journal for the Civil Engineering Utilization Field.

What began in October 1955 as an experimental six-month graduate logistics course led to the permanent establishment of the School of Systems and Logistics. The school, in cooperation with The Ohio State University, offers a 12-month graduate logistics program and a series of continuing education courses in logistics. Students who success-



Major General Grandison Gardner  
(July 1950 - January 1951)



Brigadier General Leighton I. Davis  
(January 1951 - October 1951)



Major General Ralph P. Swofford, Jr.  
(October 1951 - November 1955)





**Brigadier General Mervin E. Gross**  
(January 1946 - October 1946)



**Brigadier General Edgar P. Sorensen**  
(January 1947 - August 1948)



**Major General Laurence C. Craigie**  
(September 1948 - June 1950)

fully complete the 12-month program receive master of science degrees in logistics management.

Late in 1961 the Commander, Strategic Air Command (SAC), requested AFIT's assistance in planning an educational program for launch control officers at SAC's various Minuteman intercontinental ballistic missile sites. Such a program, it was pointed out, could attain two purposes: (1) serve to relieve the monotonous tension associated with launch control duties and (2) help meet the Air Force goal of providing a higher degree of education for its personnel without the necessity of excusing them from duty for one or two years to earn a degree on campus.

Considerable discussion followed the SAC commander's suggestion, and it was the consensus of all concerned that the plan was feasible and would be a valuable adjunct to the Minuteman missile defense system. The recommendation further stated that AFIT should be assigned the task of conducting the programs. Approval by Air Force Headquarters was given in April 1962.

AFIT inaugurated its first Minuteman program at Malmstrom AFB, Montana. It has since increased these programs to include Ellsworth AFB, South Dakota, Minot AFB, North Dakota, Whiteman AFB, Missouri, and Francis E. Warren AFB, Wyoming. The program at Malmstrom is under the supervision of

the School of Engineering; all others are monitored by the Civilian Institutions Division.

A recent acquisition of the Institute is the Air Force Nuclear Engineering Test Facility (AF NETF). In-house responsibility for this facility has been given to the School of Engineering. The NETF is an Air Force-directed and Department of Defense-supported project, and AFIT is responsible for developing its potential as a research and development tool and for its integration into the Air Force research and development inventory. Historically, the facility is an outgrowth of the Aircraft Nuclear Propulsion project. It is a 10-megawatt reactor, the seventh largest in the country, and the highest-powered reactor in the Department of Defense establishment.

The most recent addition to the AFIT structure is the Defense Weapon Systems Management Center. Established at Headquarters United States Air Force on 10 March 1964 by directive of the Secretary of Defense, it was transferred to Wright-Patterson Air Force Base in July of that year as a component of AFIT. Its mission is to provide an education program for senior military and civilian managers of major weapon systems.

A more detailed account of each of these academic organizations, including a review of their activities during the past year, is given in the following pages. ■ ■ ■



**Major General J. K. Lacey**  
(November 1955 - August 1957)



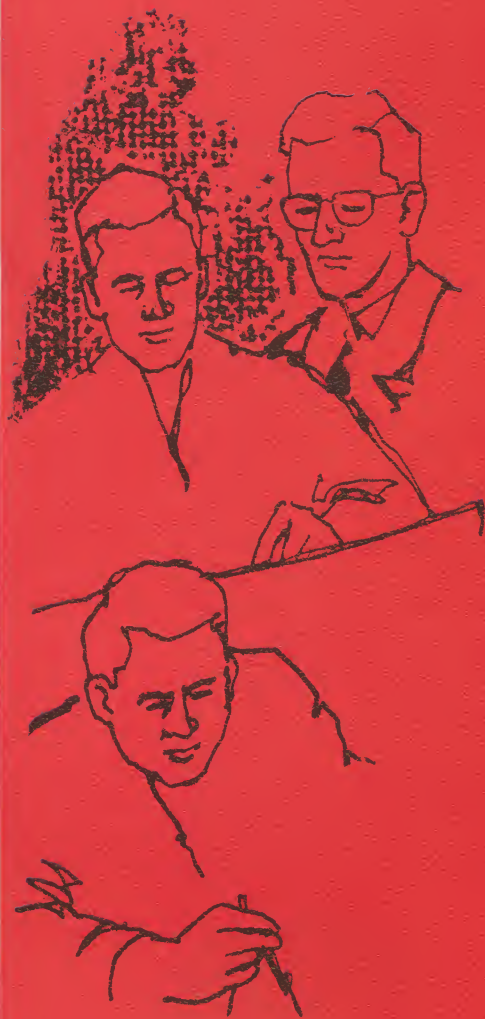
**Colonel John A. McCann**  
(April 1964 - November 1964)



**Major General Cecil E. Combs**  
(September 1957 - September 1965)



# School of Engineering



R. H. Downing, Ph.D.  
Dean



W. L. Lehmann, Ph.D., P.E.  
Asst. Dean, Research



Lt. Col. J. G. Crouch, M.S.E.  
Asst. Dean, Engineering



## Aeronautical Engineering

H. C. Larsen, M.S., P.E.



## Electrical Engineering

C. M. Zieman, Ph.D.



## Humanities

H. E. Hand, D.Ed.



## Mathematics

A. B. Carson, Ph.D.



## Mechanical Engineering

A. J. Shine, Ph.D.



## Mechanics

D. W. Breuer, Ph.D.



## Physics

L. S. Pedrotti, Ph.D.



## Systems Management

Col. W. W. Converse, Ed.D.



**B**y the end of the year, the faculty and staff had become settled in the new School of Engineering building, dedicated the previous August, and were enjoying the privilege of working in pleasant and attractive surroundings. More pleasure and satisfaction were derived, however, from the knowledge that the building was a symbol of faith and trust in their educational efforts.

In general, the year was a productive one for the School. It marked the graduation of the first class in the AFIT Minuteman Education Program (details on this are included in another section), the enrollment of the first class of students in the School of Engineering doctoral program, the incorporation of the Air Force Nuclear Engineering Test Facility (NETF) with the School of Engineering for a two-year experimental period, and achievement at the NETF of the first sustained nuclear reaction (criticality).

In February, a member of the Department of Aeronautical Engineering, Professor Peter Bielkowitz, was honored during National Engineers' Week when he was selected as one of ten outstanding engineers in the Dayton, Ohio, area. Selection of the men was based on their achievements in 1964 which contributed appreciably either to scientific knowledge and technological progress or to public welfare and safety. Professor Bielkowitz was recognized for a study he conducted at the request of the Warfare Systems School, Air University, which involved the ground tracking of 24-hour satellites in inclined elliptical orbits with various perigee positions and eccentricities.

The School of Engineering admitted its first doctoral candidates in June. Public announcement of the new program was made on 28 August 1964 during dedication ceremonies for the new School of Engineering building. At that time, Secretary of the Air Force Eugene M. Zuckert read a letter from President Johnson to General Combs, AFIT Commandant, in which the President congratulated the members of the Institute on the occasion of the dedication, and closed with the following words concerning the doctoral program:

*The establishment of a doctoral level program in the aerospace sciences, announced today by Secretary Zuckert, will expand, and strengthen, the important role of the Air Force Institute of Technology in our nation's defense program.*

*This program is in keeping with my recent remarks . . . , directing the Secretary of Defense to strengthen and broaden opportunities available to members of the military services to further their education while still in service.*

The doctoral candidates, 1 lieutenant colonel, 1 major, 7 captains, and 3 first lieutenants, will study at AFIT for two years. In that time they will complete all basic course work and qualifying examinations. They will then be assigned to an Air Force laboratory, filling regularly-assigned military spaces, where they will do research in an area of specific interest to the laboratory in which they are working. This research will provide the material for their doctoral dissertation. Throughout the period of their academic tour, both at AFIT and in the laboratory, they will be under the joint guidance of a laboratory scientist and a faculty adviser.

The first year of the curriculum provides academic course work in physics, mathematics, and mechanics. In the second year, each student will, to a large extent, specialize in his major area of interest. Limited course work to further increase the students' depth of understanding in their major fields will be encouraged while assigned to a laboratory.

The program is interdisciplinary in nature, and students completing the program and satisfactorily meeting the thesis requirements will be awarded the degree of Doctor of Aerospace Engineering.

The doctoral program is administered by a Doctoral Council of twenty AFIT faculty members and administrators, with the coordination of a Laboratory Council composed of one representative from each of the major laboratories at Wright-Patterson AFB. These Councils have the responsibility for selecting students, formulating program content, recommending laboratory assignments, and establishing policy.

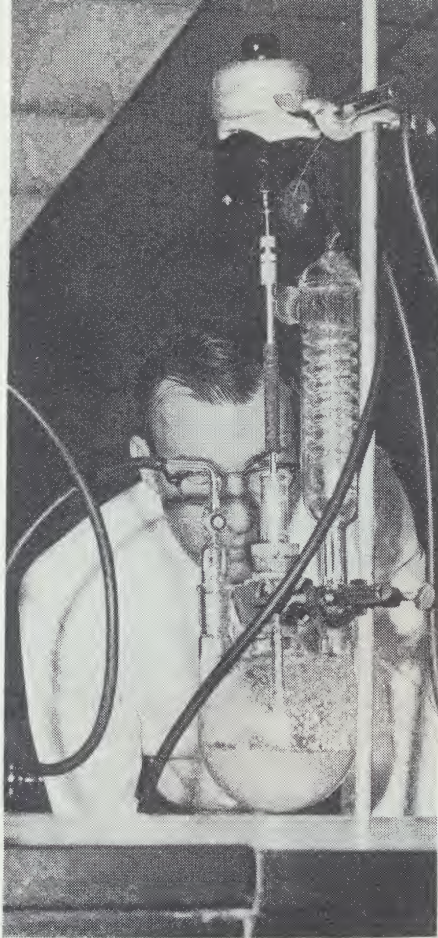


## School of Engineering

*Brigadier General Edward B. Giller, USAF Director of Science and Technology, addressing a graduate space physics class.*







Appropriate accreditation of the doctoral program was received from the North Central Association of Colleges and Secondary Schools following an inspection visit at AFIT by that Association in April 1965.

## Research

The Institute's research work is conducted primarily as an integral and essential part of graduate engineering education; however, every effort is made to insure that the total research capability at AFIT also supports the research and development activities of the Air Force. In faculty research, freedom of choice is maintained as an academic principle, and the interests and resources of on-base laboratories offer an excellent selection of areas from which to choose.

During 1965, the faculty actively participated in 60 research projects, prepared 75

research papers and 13 research technical reports for publication in professional journals, and delivered 22 research papers at professional scientific meetings. Twenty-three members of the faculty are conducting research on projects of specific interest to the following WPAFB laboratories: Aerospace Research Laboratories, Avionics Laboratory, Materials Laboratory, Flight Dynamics Laboratory, Aero-Propulsion Laboratory, and Aerospace Medical Research Laboratory.

Of the 232 students who were awarded masters degrees in 1965, 112 conducted the research for their dissertation under the sponsorship of an Air Force Laboratory. Work on the remaining 120 theses, all of which were Air Force oriented, was conducted at the Institute.

The School's research efforts are supported mainly by the laboratories of the Air Force



## School of Engineering



Systems Command and the Air Force Office of Aerospace Research. The AFIT School Shops render a specific service, however, by fabricating special items of equipment that either do not exist or cannot be purchased through base supply channels in sufficient time to be useful. This latter situation was improved somewhat this year when Air University initiated changes in the procurement procedures which now make it possible to secure supplies and equipment on a shorter time basis.

### Faculty Exchange Program

For several years, the School of Engineering has participated in a faculty exchange agreement with the College of Aeronautics, Cranfield, England. This arrangement has been enthusiastically supported by both Schools, and mutual benefits have accrued from this cross-feeding of ideas and from the opportunity to study the areas of research being pursued by the other School.

The members who participated in the exchange during the 1965 fall quarter were Professor J. J. Spillman of Cranfield and Major C. K. Grimes of the AFIT Department of Aeronautical Engineering.

### Professional Conferences

Two professional conferences were held at the School of Engineering during 1965—the Third Annual Student Conference of the American Nuclear Society (ANS) and the Conference on Matrix Methods in Structural Mechanics. Members of the AFIT student branch of the ANS and Dr. C. J. Bridgman, faculty adviser to students of the Graduate Nuclear Engineering Program, served as hosts for the ANS Conference held in April. Over 200 students and faculty members from 38 schools throughout the United States were in attendance. Of the ten awards given for the best papers presented, four were won by School of Engineering students.

The Conference on Matrix Methods in Structural Mechanics was co-sponsored by AFIT and the Air Force Flight Dynamics Laboratory (AFFDL). Co-chairmen of the



Conference were Colonel G. T. Buck, Director, AFFDL, and Dr. J. S. Przemieski, Professor of Mechanics, AFIT.

### Facilities

Modern equipment and facilities are as vital a part of effective teaching as is a competent faculty. AFIT's location, in the very center of the largest scientific, research and development, and logistics planning community in the country, provides access to a wide variety of the best and most modern scientific and logistics facilities available.

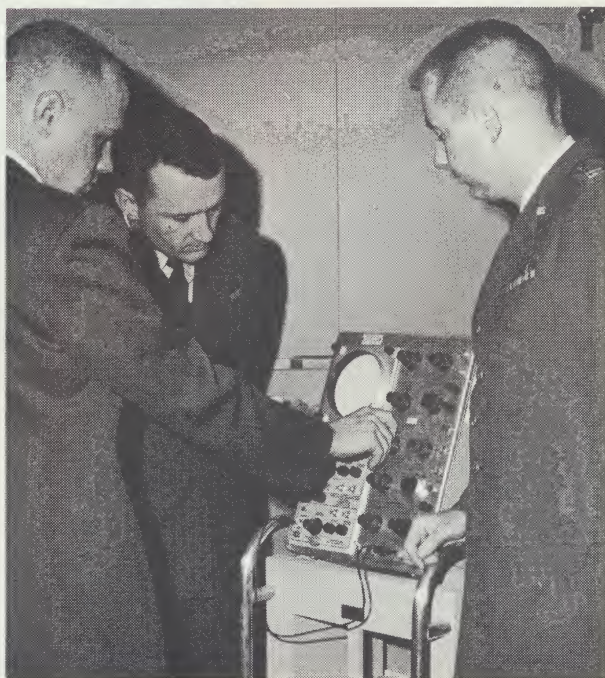
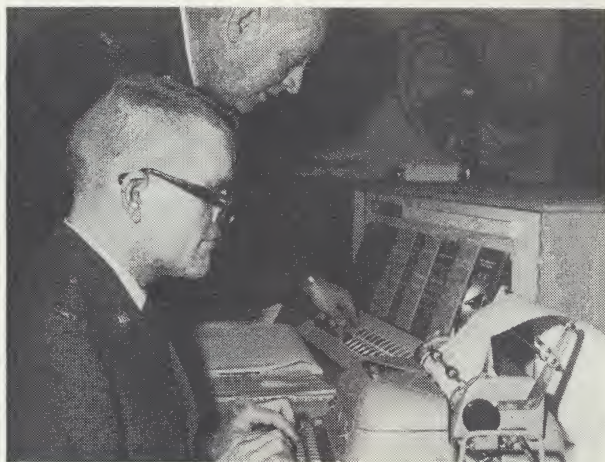
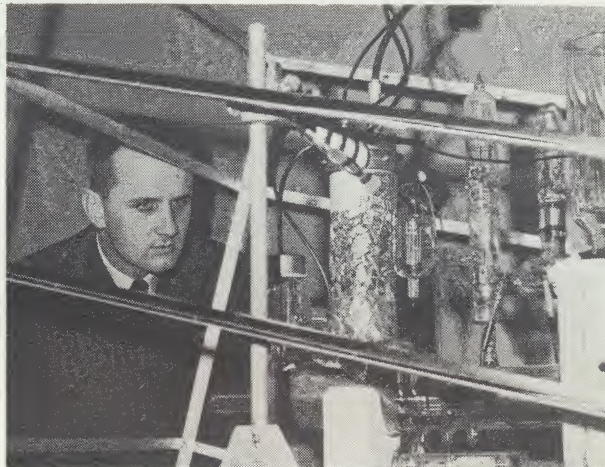
AFIT, however, does not rely completely on these on-base facilities, but has many excellent research and engineering laboratories which compare with, and often excel, those of its civilian counterparts.

Additions to these facilities during 1965 included two Model TR-48 Solid State and two Model 231-R Non-Solid State Analog Computers. Two more TR-48s will be added in 1966. These computers replace older REAC equipment for instruction in analog computation, automatic control, and research. Also available is equipment for tie-in to the digital computer. A new vertical shock tube is under construction in the Mechanical Engineering Laboratory.

Equipment is on hand for assembly of a 4" x 19" transonic wind tunnel which will have a 6" x 6" interchangeable test section that will produce speeds up to Mach 3. When completed, sometime in 1966, it will be the only facility of its kind on WPAFB.

The Department of Mechanics is in the process of obtaining space simulators that will make it possible for the faculty and students to do research on materials and equipment under conditions similar to those on the surface of the moon or in space.

The addition of these facilities to those already a part of the School of Engineering, plus the scientific equipment and facilities available through other Air Force laboratories at Wright-Patterson, provides a scientific complex of almost unlimited potentials. ■ ■ ■





# NUCLEAR ENGINEERING TEST FACILITY



Col. J. R. Bohannon, Jr., M.S., P.E.  
Director

All actions required to insure successful prosecution of the Air Force Nuclear Engineering Test Facility (AF NETF) Project were completed on or ahead of schedule during 1965. The AF NETF is a recent acquisition of the Institute and as a research laboratory comes under the purview of the School of Engineering. It is an Air Force-directed and Department of Defense-supported project, and is an outgrowth of the Aircraft Nuclear Propulsion Program. A 10-megawatt reactor with all essential support facilities and equipment (hot cells, counters, computers, etc.), it is the highest-powered steady-state reactor in the Department of Defense, and it is the only Air Force research reactor operated by Air Force personnel.

The official AFIT-NETF assigned mission is stated as follows:

"To develop the potentials of the AF NETF to support research and development, including engineering and applied testing, and to integrate the facility into the Air Force scientific, engineering, and educational community as a new and diversified tool of investigation and inquiry."

The NETF and the services of its staff are available to individuals or agencies of the Air Force or Department of Defense, to their contractors, and to surrounding universities conducting programs in fulfillment of known or anticipated Air Force requirements. Many of these programs include laboratory projects conducted by AFIT students and faculty. In this capacity, it functions both as an educational and as a research tool.

The facility's development program began at the close of 1965 with the functional transfer of the NETF's personnel (formerly assigned to the Air Force Flight Dynamics Laboratory), equipment, and supply accounts to AFIT. The efficiency with which this transfer was handled and the successful completion of the final checkout of all equipment by the building contractors were a direct result of the conscientious and deliberate efforts of all parties concerned.

To date, experiments have been conducted in the NETF in such functional and disciplinary areas as activation analysis, biomedical research, solid-state device analyses, short-life isotopes, radiation effects, and materials development. Participants in these experiments include AFIT faculty and students, Aerospace Research Laboratories; United States Air Force Hospital, Wright-Patterson AFB; United States Atomic Energy Commission; Rome Air Development Center; Avionics Laboratory; Aero-Propulsion Laboratory; Texas Instrument Corporation; United States Army Electronic Command; and the University of Cincinnati.

The successful initiation of these experiments immediately following acceptance of the facility can be attributed to the promotional program conducted by the NETF's Engineering and Experimentation Division. This included the presentation of some 30 briefings to major Air Force laboratories and contractors; the procurement of formal endorsements and support from major air commands, laboratory directors, and other De-



partment of Defense agencies; the issuance of over 2,000 brochures; and communication with over 200 project engineers.

A number of key events lead to the present status of operation:

- Achievement of the first sustained nuclear chain reaction (criticality) at the NETF at 22:27 hours on 5 April,

- Accomplishment of full-core loading and initiation of a program of zero-power calibration and testing on 14 April,

- Approval to operate and maintain the NETF upon completion of a review of the Operations Plan (TR 65-3) and Technical Specifications (TR 65-6) by the Directorate of Nuclear Safety, Kirtland AFB, New Mexico,

- Certification of the qualifications of the checkout crew members by the contractor on 9 November,

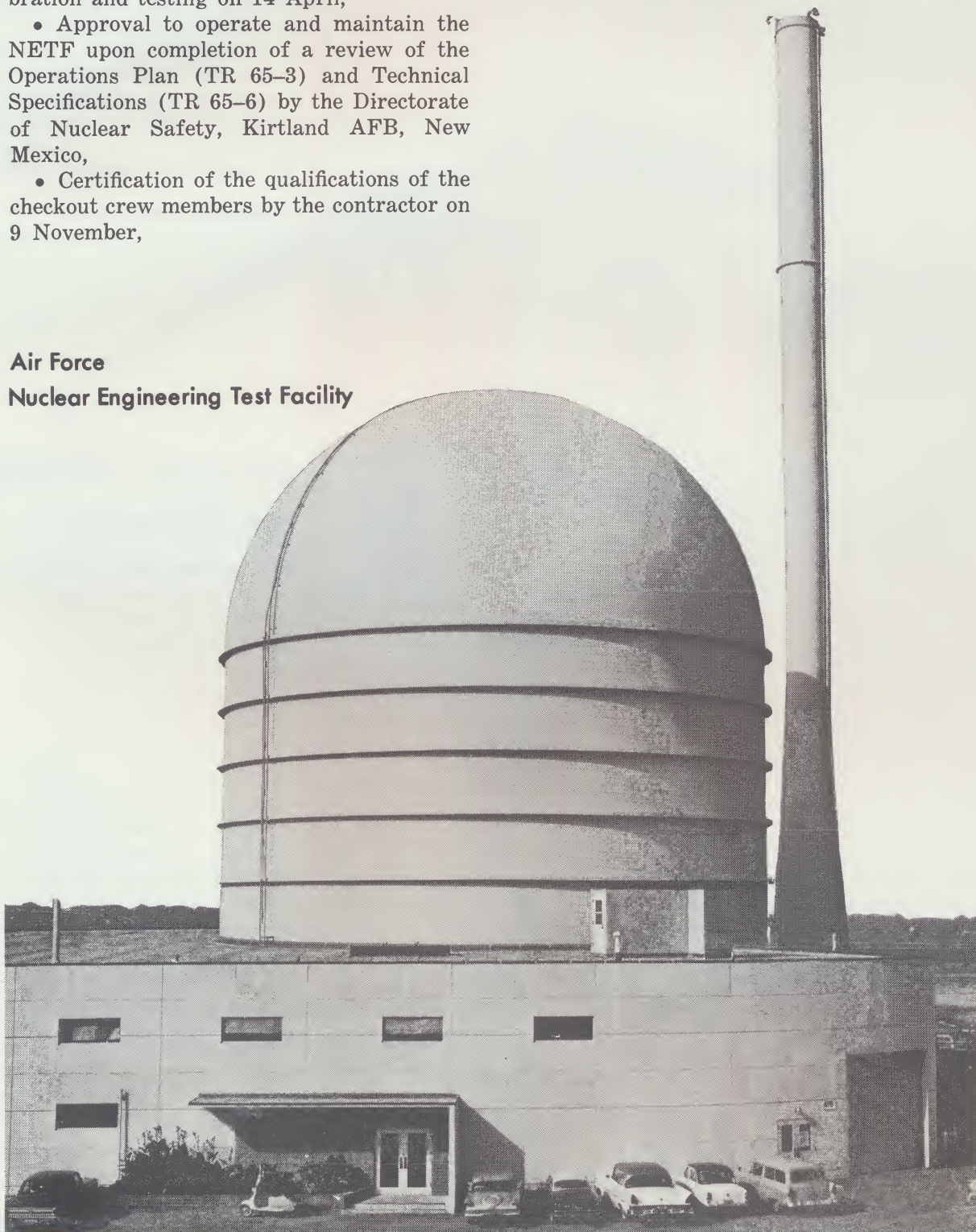
- Acceptance of the operational control of and safety responsibility for the NETF by AFIT on 9 November, and

- Transfer of the facility from the Corps of Engineers to the Air Force Institute of Technology.

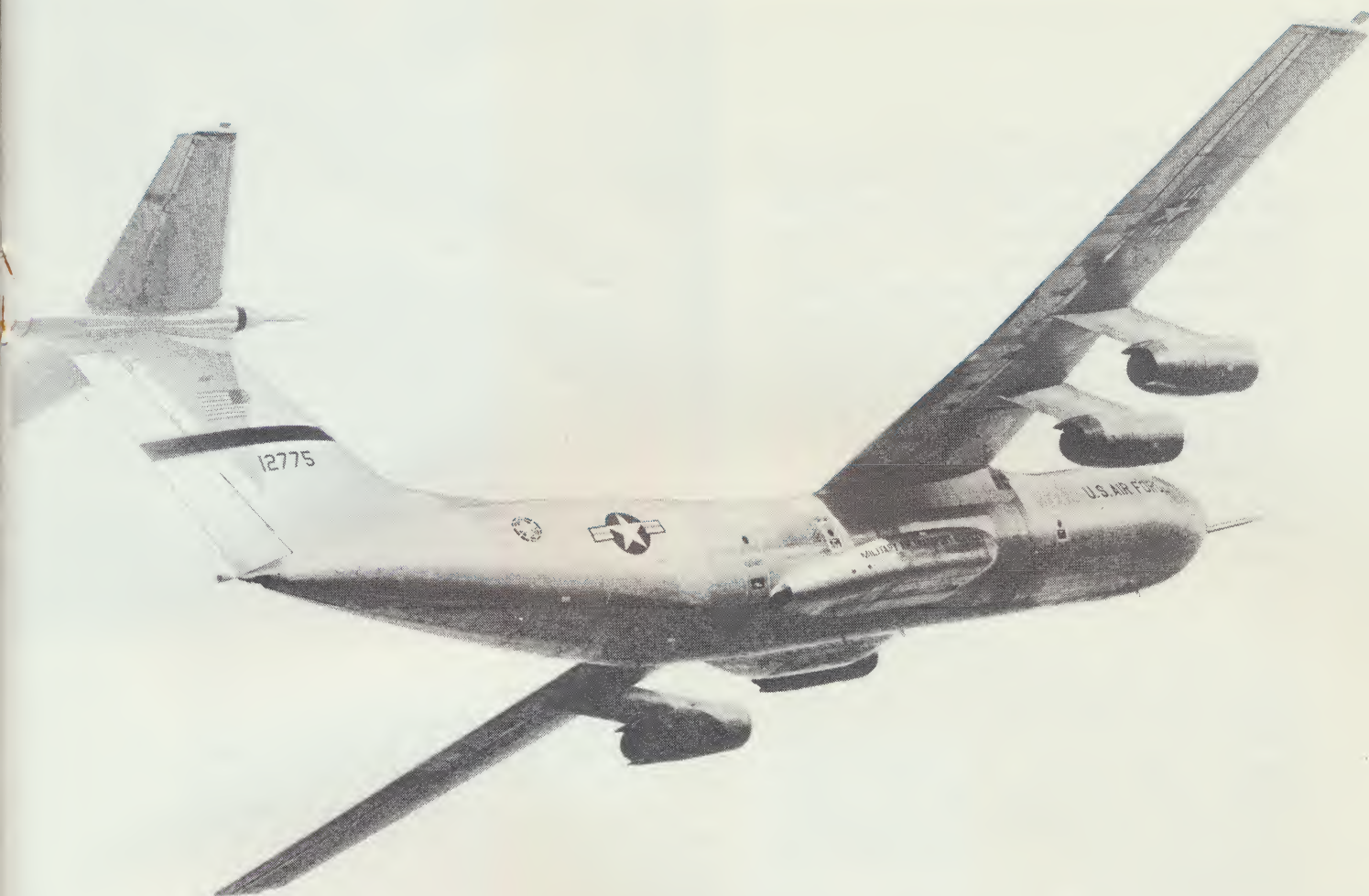
On 1 January 1966, the Project Office will begin its two-year development program in accordance with its assigned mission and defined objectives. ■ ■ ■

## Air Force

### Nuclear Engineering Test Facility







The waging of widespread counter guerrilla warfare in Southeast Asia under the most difficult circumstances has made for a host of logistical problems that do not lend themselves to conventional solutions. Response to this current challenge has resulted in the development of unusual procedures for the determination of logistical requirements, the replenishment of fighting forces in remote areas, and the maintenance of complex weapon systems far removed from supporting depots. Climate, terrain, and the nature of the conflict have compounded these problems. The human need is not only for competence in the ordinary sense, but also for a corps of logisticians who are imaginative and creative in devising new procedures, who are practical in their approach to emergencies, and who are able to apply scientific methods in the practice of their profession.

The School of Systems and Logistics is continually readjusting its curricula to meet the dictates of change. Throughout 1965, programs were expanded in scope to accommo-

date the ever-changing demands made on logisticians, and student enrollments were increased so as to provide more and better-equipped logistical personnel.

This increase in the school's academic and administrative workload made some measure of internal reorganization desirable. In order to improve operational efficiency, three directorates were created: Directorate of Graduate Education, Directorate of Continuing Education, and Directorate of Curriculum. The first is responsible for the accredited, 12-month degree-granting curriculum; the second is concerned with in-house short courses, but has supervisory responsibility for all programs conducted on sites other than Wright-Patterson AFB; and the third has responsibility for continually reviewing all course offerings to determine if they are timely and if they reflect the requirements of the organizations for which they are being given. Each directorate is headed by a director, who reports to the Dean, School of Systems and Logistics.



## Graduate Logistics Program

A Graduate Logistics Faculty Council began functioning in 1965. The Council is chaired by the Director of Graduate Education and normally meets once a week. The Council is empowered to discuss and resolve routine matters, to make policy recommendations to the Dean, School of Systems and Logistics, and to advise him on all matters affecting the Graduate Logistics Program.

The graduate logistics faculty, consisting of eleven full-time and four part-time instructors, was organized into four departments under the new Directorate of Graduate Education: Department of Quantitative Studies, Department of Management Studies, Department of Communicative Studies, Department of Research Studies and Publications. When fully staffed, the Department of Research Studies and Publications will have four scholars who will devote full time to logistics research and writing. If current plans develop, these four will have the added responsibility for editing and publishing a logistics periodical to be distributed in the near future by this school.

## School of Systems and Logistics

Graduation exercises for the Class of 1965 were held in joint ceremonies with the School of Engineering on 25 August. Of the 46 class members, 32 were from the United States Air Force, 7 from the United States Army, 4 from the United States Navy, and 3 from civilian agencies. Ten members of the class were graduated with distinction, having attained a grade point average of 3.75 or better. Each student received a logistics assignment following graduation.

A number of significant research papers were produced by the class as student theses. Thesis subjects were selected from existing logistics problems and the students' findings were sent to all interested field organizations.

The Class of 1966, composed of the full quota of 60 students, reported for processing on 19 August. The entering class was given an intensive five-weeks review in mathematics and English before starting their regular studies.

## Continuing Education Program

The increasing complexity of logistics and the more sophisticated logistical methods in use today have resulted in increased demands from the field for a program of continuing logistical education. To meet this need of the professional logistician, the School of Systems and Logistics established the Continuing Education Program, which consists of some forty short courses from one to fifteen weeks' duration. These courses are designed to provide continuing educational opportunities for managers in systems and logistics or in the functional areas of maintenance, supply, transportation, and procurement.

The size of this resident program has been governed by available living quarters and teaching space rather than by demand. Even under these limiting factors, however, the program has steadily increased year by year, and in its seven-year history, 18,835 students have received certificates of course completion.

Because there are literally thousands of military logisticians who, for one reason or another, will be unable to pursue resident courses, the Assistant Secretary of Defense directed in 1964 that this school establish a nonresident logistics management program. In response to this directive, a Department of Nonresident Studies was created in January 1965 and placed within the framework of the Directorate of Continuing Education. Three general types of nonresident programs are now either in the developmental or operational stage. They include correspondence courses, on-site courses (Zone of Interior and abroad), and international (Military Assistance Programs—MAP) courses. It should be explained that all on-site courses, both in the Zone of Interior and abroad, other than those taught for MAP, are furnished at the request of the receiving agency, and the cost of the instruction is funded by the School of Systems and Logistics. Courses taught in response to MAP's requirements are funded by that agency.

The correspondence courses are still in the developmental stage. The Air University Extension Course Institute, through agreement with the School of Systems and Logistics, will







prepare the "Logistics Management Seminar" as the first correspondence course to be offered. By the end of 1965, several chapters had been received and estimated completion date is 1 August 1966.

The Directorate of Continuing Education has been authorized an increase of six logisticians for its Department of Nonresident Studies to give it sufficient organic capability for writing other planned correspondence courses. These positions will be filled as soon as competent persons can be selected.

On-site instruction within the continental United States during 1965 was accomplished by personnel currently assigned to the Directorate of Continuing Education. Instruction in management of value engineering and defense contracting was given at 22 centers to Army, Navy, and Air Force personnel. Approximately 900 students were scheduled for the courses offered.

Maintenance and procurement courses were presented at various overseas bases in Germany, Hawaii, and Japan. One course presented at several overseas locations, Base Procurement-Base Civil Engineering, was offered with the assistance of personnel from the AFIT Civil Engineering Center.

Other overseas instruction has included a series of logistics management training courses for the Republic of Korea Air Force, and a number of courses relating to resources management for the Republic of China Air

Force. In October, a faculty member served as seminar moderator and lecturer for a management seminar conducted by the Turkish Air Force. A series of lectures on advanced management was presented in November to personnel attending the Philippine Air Force Command and Staff School in Manila.

Current plans for fiscal year 1967 include an expansion of the Graduate Logistics Program and some adjustments to the curriculum. Transportation will not be given as a course but its essential subject matter will be integrated in other courses. A course in logistics planning will replace transportation.

The student quotas for resident courses of the Continuing Education Program have been set by the Air Staff, United States Air Force, at 3,859 for fiscal year 1967, with this breakdown: Air Force-Oriented, 1,325; Air Force-Department of Defense, 1,568; and Non-Air Force, 966.

Development of correspondence courses within the Department of Nonresident Studies will probably begin in the fall of 1966. Eventually a majority of the correspondence courses will be prepared by the Department of Nonresident Studies and administered by the Extension Course Institute, Air University.

Responsibility for on-site courses in the continental United States will be transferred to the Department of Nonresident Studies after 1 July 1966. The Department of Maintenance, Supply, and Transportation, by the addition of 11 officers, will provide instruction for the maintenance courses, and will send traveling teams to each requesting base.

The Military Assistance Program will have a requirement for the training of an estimated 500 personnel during fiscal year 1967. Preliminary reports indicate a requirement to send mobile instructional teams to the Philippines, Australia, Vietnam, Korea, and Peru. Other countries are expected to request training items. A catalogue has been prepared to provide information on the expanded logistics management program for MAP countries.

Over-all, it is significant and worthy of especial note that the Directorate of Continuing Education will instruct more than 7,000 logisticians during fiscal year 1967. ■ ■ ■



# Civil Engineering Center



## Advanced Engineering

Lt. Col. R. D. Marlow, B.S. (CE), P.E.



Col. V. L. Hastings, M.S. (IE)  
Director



## Engineering Orientation

Lt. Col. H. B. Arnold, M.E. (CE), P.E.



## Nonresident Studies

E. E. Peer, B.S. (EE), P.E.



## Research Studies

Lt. Col. D. R. Woods, Ed.D., P.E.





If one word could adequately describe the operation of the Civil Engineering Center during 1965, it would probably be *expansion*. This word could, however, be aptly applied to the Center since its origin in 1948, when less than 100 officers were graduated that year. By contrast, over 900 officers and officer-grade civilians received instruction through AFIT resident and oversea courses in 1965.

When the Center was established in 1947 as the Air Installations Engineering Special Staff Officers Course its mission was to provide the training necessary to update the civil engineering knowledge of base installation officers. A broadening of the scope of base civil engineer duties and the requirement that the Center include instruction for installation engineering officers at all levels of command have made it necessary for the Center to make many changes in its curriculum since the original program was offered. To accommodate these requirements imposed by Headquarters United States Air Force and

various Air Force commands throughout the United States and overseas, the Center has increased its course offerings to eight: Base Civil Engineer, Executive Engineering, Nuclear Defense Engineering, Pavement Engineering, Control Center Management, Network Planning, Applied Engineering, and Cold Regions Engineering.

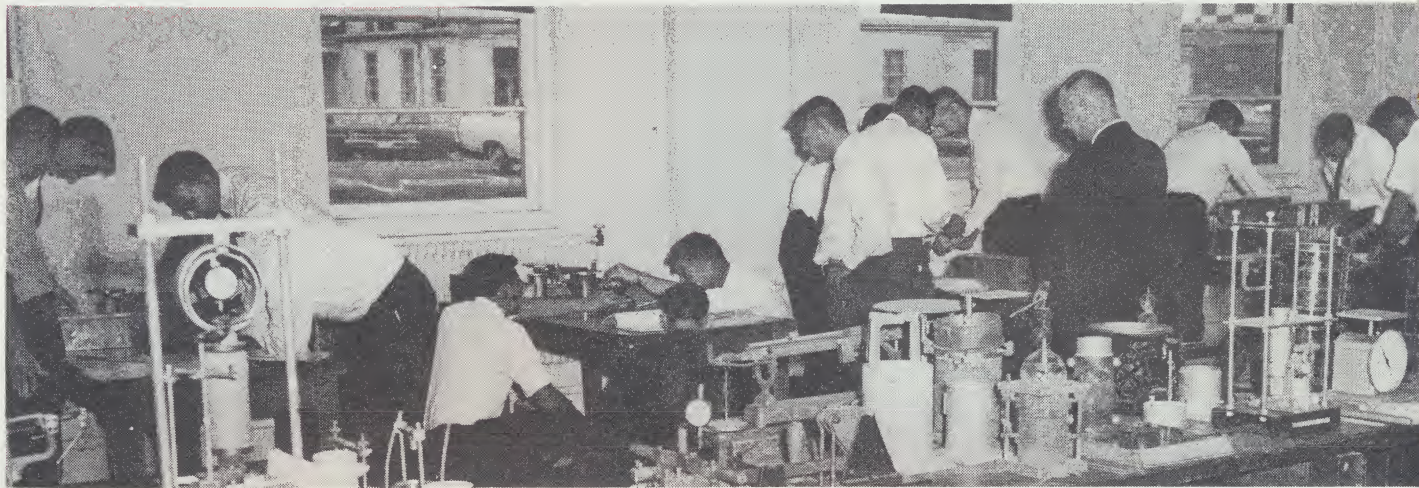
### Materials Testing Laboratory

A rearrangement of the Center's classrooms, made possible when the school was moved from one building to another, permitted the inclusion of contiguous space for a much-needed modern Materials Testing Laboratory. The original Laboratory, because of its remote location, was restricted to soils testing. In the first six months of operation, the laboratory supported not only students of the Civil Engineering Center but also personnel of the Air Force Logistics Command.





## Civil Engineering Center



By moving to other quarters, it was possible to provide a classroom for the Base Civil Engineer Course that would accommodate a larger group of students at one time. With a maximum enrollment of 75 students per class, three offerings a year will accommodate the same annual quota that previously required four. The advantage of this arrangement is that the instructors can use the extra time to enhance their academic proficiencies or conduct shortened specialized courses overseas.

Preparatory to updating the Nuclear Defense Engineering Course to include instruction on civil defense fallout shelters, a member of the Department of Advanced Engineering attended a five-week course on this subject at The Pennsylvania State University. Following his certification as an Air Force instructor in Civil Defense Fallout Shelter Analysis, the Nuclear Defense Engineering Course was extended from 10 to 14 days to permit instruction on this subject. Students successfully completing the AFIT course are certified as Civil Defense Fallout Shelter Analysts.

A power simulator, designed by members of the faculty and built by the AFIT School Shops, provides the opportunity to demon-

strate theoretical considerations of practical problems offered as course work in the Applied Engineering Course. By using this device, students now have the opportunity to simulate conditions for observing and correcting power circuit problems.

### Overseas Instruction

In 1964, at the request of Headquarters United States Air Force, Europe, as approved by Headquarters United States Air Force, two members of this organization traveled to Europe and presented the first overseas instruction offered by the Civil Engineering Center. The material presented was a modification of the one-week Control Center Management Course. The instruction was so well received that the Center was requested to give other offerings in 1965 and to increase the bases visited to include Thailand, Hawaii, and Crete. The programs presented were modifications of existing resident courses in control center management and network planning. A traveling team of five instructors made the presentations. There are specific advantages to be gained from teaching an individual in his native environment, where the





instruction can be adapted to existing conditions and problem areas. Providing overseas instruction also makes the programs available to persons who do not find it possible to come to the United States.

The Department of Nonresident Studies has the responsibility for publishing the *Air Force Civil Engineer* magazine. Published quarterly, it is the official nondirective Headquarters USAF departmental publication on civil engineering. The department also published a yearly revision to the Directory of Registered Professional Engineers and Architects. In preparing the revision this year, an increase of five per cent was noted in the registration of professional engineers and architects over 1964.

### ECI Course

In addition to the nonresident instruction presented at overseas bases, the Center provides course material to the Extension Course Institute (ECI) at Air University. Since initiation in 1964 of the ECI course entitled Base Civil Engineer, 200 individuals have completed the course and 600 are now

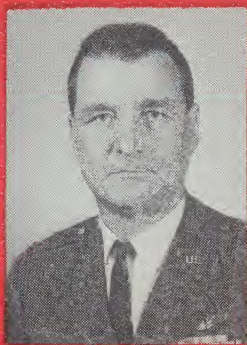
enrolled. Revisions to the course are provided by the Center as required to update the contents.

The Department of Research Studies has the responsibility for conducting research on managerial, organizational, operational, educational, and professional areas relating to present and future Air Force Civil Engineer activities. One phase of its mission is the preparation of a Report on the Qualitative Educational Requirements for the Civil Engineering Utilization Field for use by the Air Force Educational Requirements Board. This Board was established for the purpose of identifying and describing current and future qualitative specialized educational requirements necessary to providing the knowledge and skills needed for entry and satisfactory progress in each officer specialty. To assist the Board members in this task, a panel of experienced senior officers, assisted by military and civilian consultants, was organized for each career area. The Report prepared by the Department of Research Studies contains the recommendations of the Civil Engineering Career Area Panel on the Civil Engineering Utilization Field. The third cycle of this Report was completed by this Department in 1965.

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# Defense Weapon Systems Management Center



Col. J. H. Harris, M.S.E.  
Commandant



Activities at the Defense Weapon Systems Management Center (DWSMC) were appropriately summarized by the Honorable Robert H. Charles, Assistant Secretary of the Air Force, in his address to the Center's graduates on 10 December 1965.

"I don't have to tell you that the scientific and technological, as well as the economic and industrial, aspects of national security are in an era of revolution. Since World War II, and particularly during the past decade, the Department of Defense has had to develop new management techniques and attitudes to match this revolution. Beginning with the management system, set up to bring the ICBM into operation, and later the Polaris, the system/project manager device has evolved to the point where it has been accepted and adopted throughout the Department of Defense—and in other agencies as well—to handle the larger and more complex acquisition programs.

"The presence in this class of students from all the military services as well as from the National Aeronautics and Space Administration, the Federal Aviation Agency, Canada, and defense industries, attests to the increasingly widespread use of this management technique. The old tried-and-true methods of management have been replaced by new tools and techniques. Defense managers now use such terms as systems analysis and simulations. Any meeting of systems managers now includes the dropping of such phrases as critical path analysis, PERT, real time, and information retrieval."

Presentation of new management techniques and of the language changes that result therefrom is, of course, the primary mission of DWSMC. One of the newest techniques has an innovator in Mr. Charles himself, who states in a later portion of his address:

"You may have heard of the *total package* concept with which we are experimenting on the C-5A program and which, if successful, we intend to apply to other programs such as SRAM. Stripped to its essentials, the total



package plan is intended to permit the awarding of contracts competitively, where performance and schedule are related to cost, and *on a basis of total responsibility*. These are the key words. But we in the government have for many years been living in an atmosphere of cost-plus and sole source, where more controls by the customer are needed; and this relinquishment of authority will, for many, be a shocking experience. But it must be done if we are to get the best results—performance, schedule, and cost—from our industrial partners, and you are the ones who will have to do it.”

As Mr. Charles emphasized, competition is the purpose behind this development of the total package concept which, although still in the experimental stage, is finding many applications, some of which are used as the basis of lectures and case studies in the DWSMC curriculum. Besides the Air Force's C-5A and SRAM, the Navy equivalent of the total package concept has been used with the A-7A and the OV-10. In the Army, a likely candidate is LOH Avionics.

The authority for DWSMC to provide a total education package in systems management was established in Air Force Regulation 53-9.

### Future Plans

In addition to the current Senior Resident Course, DWSMC is preparing plans for becoming a Center in the true sense of the word. These plans include offerings of resident and non-resident short courses in such subjects as cost estimating, configuration management, and integrated logistics support. A correspondence course is already under way. Seminars, publications, and research of new techniques should establish DWSMC as an institute of systems management.

In a discussion of the Navy's philosophy of project management, Vice Admiral I. V. Galantin, Chief of Naval Material, made the following statement:

“No one knows better than I do the urgent necessity for an immediate increase in the

numbers of men who are thoroughly qualified to occupy key positions in project management. I know also that the other services and other branches of the government similarly have pressing need for people who can categorically take control of a project and say ‘I can do the job.’”

Preparing selected military and civilian personnel of all Department of Defense components to meet that need is the responsibility of DWSMC, for it is here that they are trained in the effective management of programs concerned with the development, acquisition, and integrated logistic support of weapon and support systems. In carrying out its mission, the Center stresses the identification and solution of typical systems/project management problems, and offers a program of instruction that is closely allied with actual rather than hypothetical problems.

### Prime Objective

Because the Center's prime objective is to maximize its service to the military departments, its faculty consists of commissioned officers from the Army, Navy, and Air Force. Selection is based on their academic backgrounds and the managerial skills they have acquired through recent assignments involving systems development and acquisition management.

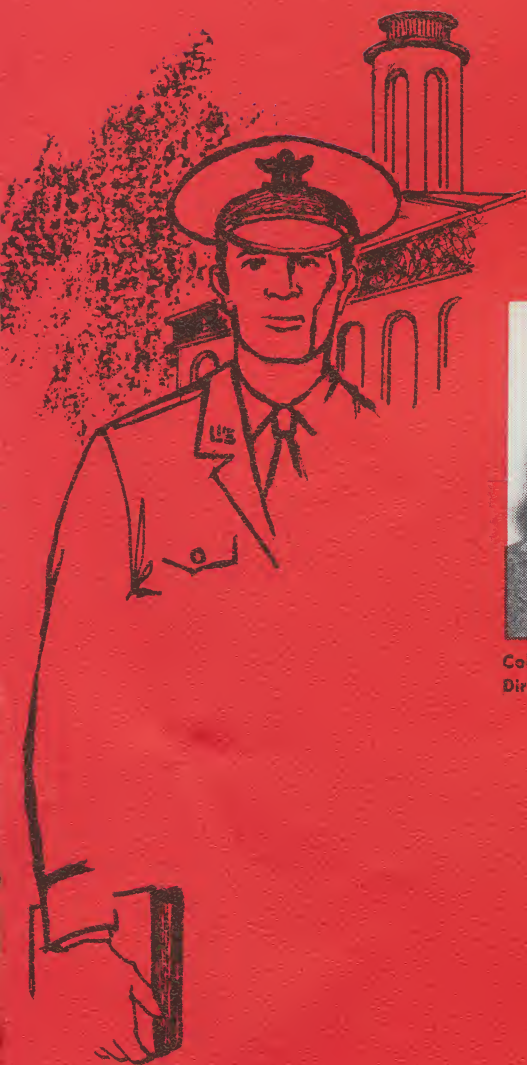
The program offered by the Center is presented by means of lectures, seminars, case studies, and exercises. The faculty is augmented by visiting lecturers representing line and functional specialties concerned with systems/project management. An important faculty contribution is made by The Ohio State University Research Foundation.

Although the Defense Weapon Systems Management Center has been in existence for only a short time, its graduates are rapidly making their presence known. And with the realization of the planned expansion of the Center's capability to conduct research in weapon systems management concepts and practices, future graduates should make even greater contributions in this field.





# Civilian Institutions Division



Col. M. R. Palmer, M.A.  
Director



## Scientific Education

Lt. Col. E. B. Sherrill, B.S.



## Professional Education

Lt. Col. T. E. Hopper, M.B.A.



The Civilian Institutions Division is charged with the responsibility of providing education and training programs at civilian colleges, universities, research centers, hospitals, and industrial organizations to meet specific Air Force education requirements. The programs involved in the fulfillment of this mission range from short courses varying from 1-13 weeks to doctoral programs for officers which may require as long as three years for completion of requirements for the degree. Most degree programs are the regular college curricula with little variation. A few are partially tailored to meet special Air Force requirements. Examples in this category are the Applied Comptrollership Program at Michigan State University and Research and Development Management Programs at the University of Chicago, Rensselaer Polytechnic Institute, and the University of Southern California.

Other specialized requirements include the preparation of military personnel for assignments as instructors at the Air Force Acad-

emy and the Air Force Institute of Technology; undergraduate, graduate, postdoctoral, and resident programs for medical personnel assigned to the Surgeon General's office; and undergraduate and graduate education for foreign officers studying under the Military Assistance Program. Under the Airman Education and Commissioning Program, qualified airmen pursue undergraduate curricula as a prerequisite for commissioning through the Officer Training School. This division monitors the education programs of all graduates of the Air Force Reserve Officer Training Corps (AFROTC) who obtain a delay of entry to active duty for the purpose of earning a graduate degree at their own expense. These students are referred to as Category "C" Delay Reservists. Also monitored are the programs of Air Force officers who are permitted to study under scholarships and fellowships granted by civilian colleges, universities, and foundations.

This division also has supervisory responsibility for five of the six Minuteman Education





Programs located at bases of the Strategic Air Command. A discussion of this program is included as a separate part of this report.

Through its civilian institutions programs the Institute maintains close contact with civilian colleges and universities and gains first-hand knowledge of their developments in academic subjects of special interest to the Air Force. This relationship provides AFIT with greater flexibility in meeting its educational requirements, and also provides the opportunity for timely exchange of ideas with educational leaders as a means of evaluating and strengthening all programs offered by the Institute.

The Training-With-Industry program provides the Air Force with a vast source of management and engineering educational experience unobtainable in any other manner. Officers with undergraduate or graduate degrees in engineering or business are provided an opportunity to gain knowledge of the management structure, engineering and produc-

ings, and availability for entry as determined by current Air Force mission requirements form the basis for determining their eligibility.

### Program Control

Each student's program is controlled by his faculty adviser (a company coordinator for TWI students), and by the program monitor in the Civilian Institutions Division. The program monitor must approve the student's initial education plan and any changes to it. Most of the program monitors are recent graduates of an AFIT program and all are fully qualified in the academic areas they monitor. Contacts with students are maintained by staff visits, correspondence, and telephone, and by the use of a monthly publication entitled *Contact*. One of the students at each institution is designated as Liaison Officer, and he is responsible to the Commandant, AFIT, through the Director, Civilian Institutions Division, for the control of all other students attending the same institution. Administrative functions of the Liaison Officers are accomplished with the assistance of Professors of Aerospace Studies at colleges and universities and Company Coordinators at industries, as appropriate.

### Scope of Education

Currently, 3,480 officers and 743 airmen are enrolled in 97 colleges and universities in the United States, in 10 foreign universities, in 26 industries, and in 93 hospitals. Although such programs as medical, Air Force Academy and AFIT instructor, scholarship, and the Distinguished Military Graduate Program of AFROTC require the use of many universities, 82 per cent of the officers in the regular AFIT quota programs are enrolled in 29 colleges and universities, and 90 per cent of the airmen are enrolled in 14 colleges and universities.

### Program Trends

During 1965, a sharp decline occurred in the number of officer students enrolled in engineering degree programs, decreasing from an

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## Civilian Institutions Division

tion methods, and contracting procedures used by major industries in fulfilling Air Force requirements for the development and production of weapon systems and the provision of various kinds of special products and services.

### Selection of Students

Participation in civilian institutions programs is on a voluntary basis for both officers and airmen. Quotas are established by Air Force Headquarters. The AFIT Admissions Division determines the academic eligibility of all students and selects airmen for the Airman Education and Commissioning Program. Selection is based on the airman's academic performance and a review of an evaluation of his potential as an Air Force officer as contained in a board report from his local command. Officers are selected for the program by an Air Force Selection Board. Academic backgrounds, officer performance rat-





enrollment of 974 as of 1 January 1965 to 477 as of 1 January 1966. This downward trend can be attributed primarily to a major reduction in quotas in undergraduate engineering and an equally critical reduction in the availability of officers for graduate engineering programs because of increased Air Force mission requirements world-wide.

By contrast, during this same period, a marked increase was noted in the number of officers enrolled in masters degree programs in management—from 310 as of 1 January 1965 to 560 as of 1 January 1966. This increase was possible because of the availability of a greater number of academically-qualified officers.

The Training-With-Industry program has grown from 23 quota spaces in 1947 to its present quota of 150 spaces for fiscal year 1966. However, because of priority mission requirements, only 92 officers were made available for attendance in the 1966 program. In the absence of any change in these requirements, this program can be expected to remain at or slightly above the current level of participation.

The Category "C" program has shown a marked increase in enrollments during the past year. Currently, there are 1,279 officers in the program, the highest enrollment since the program began. A probable increase in the ceiling for Air Force officers and the need for increased numbers of junior officers should bring about a substantial reduction of Category "C" officers within the next year.

The Airman Education and Commissioning Program with an annual input of 400 airmen and a continuing enrollment of approximately 800 is expected to remain at current levels.

### Degree Attainment

The number of officers receiving degrees from civilian institutions in fiscal year 1965 reached an all-time high in the fields of engineering, biophysical sciences, and management. Distribution of these degrees by academic field and degree level was as follows:

<i>Academic Field</i>	<i>Degree Level</i>			<i>Total</i>
	<i>B</i>	<i>M</i>	<i>D</i>	
Engineering	415	356	20	791
Biophysical Sciences	53	141	20	214
Management	14	248	3	265
Totals	482	745	43	1,270

As indicated in the earlier discussion of declining officer enrollments, the number of officers receiving degrees in engineering and biophysical sciences will be reduced by approximately 50 per cent in fiscal year 1966. On the other hand, the number of officers receiving degrees in management in fiscal year 1966 should increase approximately 33 1/3 per cent. During fiscal year 1965, airmen in the Airman Education and Commissioning Program earned 183 degrees in engineering, 40 in the biophysical sciences, and 103 in management. All degrees were at the baccalaureate level. Since airman enrollment is expected to remain near current levels, the number receiving degrees in these fields in fiscal year 1966 is estimated to be approximately the same as in fiscal year 1965. ■ ■ ■



# Admissions



H. E. Lillie, M.A.  
Director

Since field counseling services are considered the most effective means of acquainting Air Force personnel with the educational opportunities available through AFIT, the Admissions Division expanded this operation during 1965. Periodically, staff members made presentations to AFROTC groups, to students at the Squadron Officer School, and to officers and airmen stationed at bases throughout the continental United States. They also visited twelve overseas bases in the Pacific Air Command. Base commanders and their staffs were extremely cooperative in providing adequate publicity in advance of these visits to insure maximum participation by interested individuals. The Institute is grateful for their support.

During the visits of the field counselors, group briefings were given on the officer and

airman programs, and interested personnel were encouraged to submit an AFIT application for evaluation. They were also offered the opportunity to discuss their applications in individual interviews at the end of the briefings. After an application is received at AFIT and evaluated, the applicant is advised of his eligibility to pursue an AFIT program. If he is not eligible, he is informed of the action he must take to meet the necessary academic prerequisites.

Of the 400 quota spaces available in the Airman Education and Commissioning Program for fiscal year 1966, less than 40 remain for which an applicant has not been selected or identified. As in past years, the most difficult quotas to fill are those in engineering, meteorology, and photographic science. There are strong indications that at least half of the 40 remaining spaces will be filled by 15 March 1966, at which time any remaining spaces will be converted to other academic fields and filled from applications on hand. It is of interest that 175 formal applications are currently on hand, 66 per cent of which are for nontechnical fields for which no fiscal year 1966 spaces remain. The other 34 per cent are for technical fields and were submitted by applicants who are not yet academically qualified but are currently enrolled in additional course work. During the first half of fiscal year 1966, 698 requests for evaluation were received; 425 letters of eligibility were issued; and 297 formal applications were accepted. The fiscal year 1967 quotas have been established and are essentially identical with those for fiscal year 1966. The Airman Education and Commissioning Program Selection Committee will start filling these quotas on a continuous basis in late April 1966 from applications on hand and periodically thereafter from applications as they are received.

Substantial progress was made during this period in the Institute's efforts to update the records of the Academic Transcript Repository. The Repository contains a collection of the academic transcripts of all Air Force officers who are eligible for consideration for AFIT programs. Eligible officers are those



with twelve years or less of total active federal military service. In the initial establishment of the Repository, which was a joint effort of Headquarters United States Air Force, Headquarters Air University, and AFIT, transcript summaries were prepared from each officer's academic record and this information was transferred to electronic tapes for use on computers at Air University. The immediate availability of this information makes it possible to communicate directly with officers about their future educational desires and, where interest is indicated, permits the long-range planning for placing the officers in school.

During 1965, 17,157 transcripts were received for evaluation in the updating project, and the academic records of 27,421 officers were added to the Repository. In conjunction

with this project and others, an evaluation was made of the educational achievements of 37,792 officers to determine grade point averages, academic specialties, colleges attended, and degrees received. A more extensive review was made of the records of 2,577 officers in the compilation of educational summaries for use by the Air Force Headquarters Committee on AFIT Selections in considering fiscal year 1967 applicants.

The lack of officers who could be declared eligible to fill educational quotas in technical fields continued to be a matter of great concern to this organization. The reverse was true, however, in the nontechnical fields; consequently, the number of qualified applicants outnumbered the spaces available for fiscal year 1966 and resulted in intensive competition for these positions. ■ ■ ■







# Minuteman Education Program

Readers of the 1964 Commandant's Annual Report may recall that education programs are being provided at Minuteman Missile bases in the Strategic Air Command (SAC) for the purpose of relieving the monotony and tension associated with the duties of a Launch Control Officer (LCO) and of providing them the opportunity to advance their educational level during their tour of duty. To date, Minuteman Education Programs have been established at five Strategic Air Command bases and a sixth program is scheduled to begin in July 1966.

The first program was established at Malmstrom Air Force Base, Montana, by the School of Engineering in September 1962 and provided an LCO the opportunity to obtain a master of science degree in aerospace engineering. Sixteen officers in this program received their degrees in October 1965, an additional 22 will receive degrees in January 1966, and the remainder are scheduled to graduate by September 1966. A rather high attrition rate has been experienced at Malmstrom due primarily to problems associated with the development of Malmstrom as the first operational Minuteman base. However, the need for such a program and the feasibility of presenting it have been proven. In fact, a second-cycle program has begun at Malmstrom for replacement crew members. Participants in this second cycle, depending on their academic backgrounds, will receive the master of science degree in aerospace engineering at Malmstrom or will complete a sufficient number of courses to enable attainment of a degree in residence at the School of Engineering subsequent to completion of their tour of duty as Launch Control Officers.

Minuteman Education Programs supervised by the Civilian Institutions Division and presented under contract with a civilian university include a master of science degree program in industrial management at Minot AFB, North Dakota, offered by the Univer-



**A**s we review our experiences during the past year, we quickly note the many areas in which truly noteworthy progress has been made. We observe also that at times our plans had to be adjusted to coincide with the urgent demands thrust upon our nation because of its dominant role of leadership in world affairs. This adjustment has presented challenges to our often-demonstrated versatility in accomplishing our purpose—that of providing education to members of the Air Force as set forth in our mission requirements. As we try to envision the future, we are aware that these challenges will continue, and, in all sincerity, we would not have it otherwise, for challenge is the backbone of progress.

Although my tenure at AFIT has been of relatively short duration, I have become extremely conscious of the accomplishments of my most able predecessor, Major General Cecil E. Combs, and of the wonderful support he has received from the faculty and staff. And as I review these achievements, I experience a great sense of admiration for an organization that is able to fulfill its mission so capably while adjusting to changing situations.

The most serious problem has been the difficulty the Air Force has encountered in identifying a sufficient number of technically-qualified officers who can be made available to fill the educational quotas in science and technology. This is due to a number of reasons, but is, of course, conditioned greatly by the conflict in Southeast Asia. If previous predictions of Air Force needs are valid, this could develop into a shortage of potential students for these critical engineering and scientific specialties. As a partial remedy to the situation, AFIT is attempting to develop a means for redirecting the education of officers with baccalaureate degrees in nonscientific fields and for providing refresher and up-dated courses for officers lacking sufficient grades to enter graduate scientific and engineering programs. AFIT's major effort in this direction will be in the School of Engineering where frequently-tested flexibility exists.

The shortage of available officers in critical areas also had an adverse effect on programs monitored by the Civilian Institutions Division. These programs provide for college education for Air Force officers through

*. . . a welcome to the new Commandant . . . a master's degree to an Air Force officer*





regular college-degree programs in civilian educational institutions. Here, also, a reduction in enrollment was especially heavy in the engineering field where the drop was over 50 per cent. However, this was counter-balanced somewhat by an increase in the number of enrollees in management programs.

The Minuteman Education Program is an example of AFIT's capability for establishing programs on short notice to meet Air Force needs and contingencies. This program is

spite of the unexpected initial attrition rate, which resulted from reasons other than scholastic aptitude, the Malmstrom program is clearly a success.

The new doctoral program offered by the School of Engineering marks AFIT's entrance into the highest level of academic endeavor. United States Air Force approval to offer a doctor of engineering science program and appropriate accreditation by the North Central Association of Colleges and Secondary Schools preceded enrollment of the initial class of twelve.

Further evidence of maturity and growth were shown by the strengthening of our mutual faculty exchange program with the College of Aeronautics at Cranfield, England; the hosting of an international conference on structural mechanics sponsored by the School of Engineering's Department of Mechanics; and the hosting of the annual student conference of the American Nuclear Society by the AFIT chapter of the ANS. The visiting lecturer's program, generally in the humanities, has been augmented by a scientific lecture series hosted by the AFIT Sigma Xi Club and sponsored by the Air Force Office of Aerospace Sciences.

The activation of the Air Force Nuclear Engineering Test Facility (AF NETF) and

## The Year in Review

described in detail in another part of this report. However, I would like to note here that AFIT has activated five programs at various Minuteman missile sites since 1962 and is preparing to inaugurate a sixth in July 1966 at Grand Forks Air Force Base, North Dakota. One cycle at Malmstrom Air Force Base, Montana, and the first to be activated, has been completed, and students of this first group were awarded masters' degrees in aerospace engineering in the fall of 1965. In





its acceptance by AFIT as an Air Force research laboratory present another avenue of opportunity through which the Institute may be of service to the United States Air Force. An extensive research program is planned for the NETF, and the work that has been accomplished toward its fulfillment indicates attainment of a high level of achievement.

The School of Systems and Logistics continued to grow and to develop new offerings to meet Air Force requirements. This was particularly noticeable in the continuing education courses, where course offerings were revised, added, or deleted as dictated by the requirements of the using commands. The limitations on resident enrollments in the continuing education courses are those imposed by housing at Wright-Patterson AFB rather than by demand from the using agencies. In order to alleviate this restriction to some extent, but more importantly to provide education when and where it was needed, many short courses were given on site at bases in the United States and overseas. AFIT's activity in on-site work is growing and is further manifestation of our endeavor to meet validated educational needs wherever and whenever we are capable of doing so.

The concept of providing continuing education programs on site emerged as a new

and important contribution of the Civil Engineering Center, particularly in Southeast Asia where new problems of construction became the order of the day.

The new and distinctive program in Defense Weapon Systems Management, sponsored by the Department of Defense, is rapidly proving its effectiveness. Although all AFIT organizations accept enrollees from the other services, the Defense Weapon Systems Management Center is specifically established for this purpose. The wholehearted cooperation provided by the many experts from the services, from the Department of Defense, and from industry who participate as lecturers provide an up-to-date fount of knowledge of inestimable value.

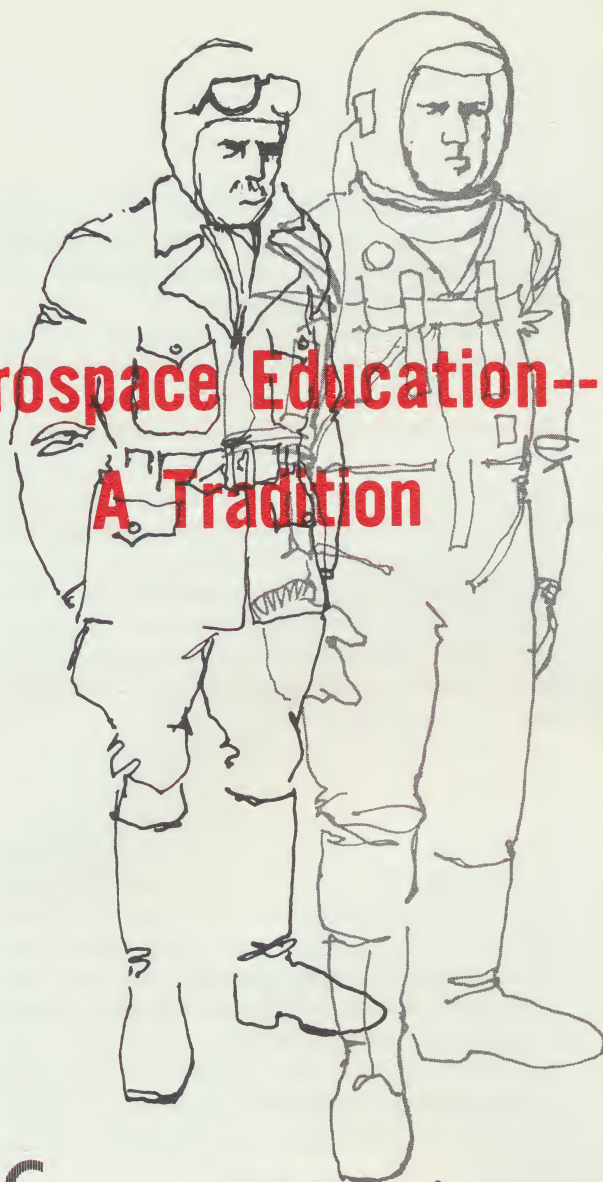
As the year's activities are reviewed in retrospect, it is amazing to note the growth in the size and scope of the operation over that of a few years ago. The fact that over 15,000 students were enrolled in AFIT programs during fiscal year 1965 would seem to prove that the faculty and staff have been successful in their constant efforts to improve the quality of their work and to adjust their methods of operation to ever-changing conditions. The extension of AFIT's influence further attests to its ability to meet Air Force educational requirements at the highest level.

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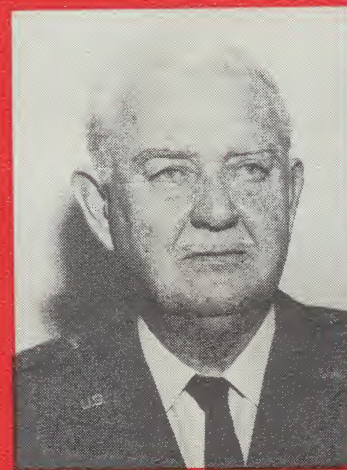


# Aerospace Education-- A Tradition

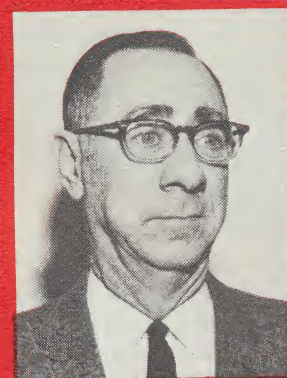


Concurrent with the forging of aerospace power, there emerged a new breed of fighting men. These men recognized the dynamic capabilities of aerospace vehicles, and their pioneering work in observation balloons, blimps, DHs, and Jennys fired their imaginations. Being both visionaries and realists, they sought to accelerate the development of an air vehicle that would fly faster, further, and more safely. They felt that the answer lay in technical education.

Among the first schools specializing in aeronautical engineering was the Army's Air School of Application, which was established at McCook Field, Dayton, Ohio, in 1919. This school, the predecessor to the Air Force Institute of Technology (AFIT), was placed under the command of Colonel Thurman H. Bane, who conceived the original idea of an aeronautical school within the Army. With a student enrollment of seven officers and a faculty



Col. John A. McCann, M.A.  
Deputy Commandant



Howard W. Barlow, Eng. Sc.D., P.E.  
Academic Director

composed of engineering specialists assigned to McCook Field, the school held its first class in November.

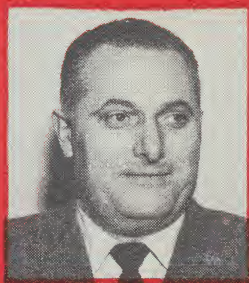
Through the years the school has grown both in stature and in enrollment and has taken a prominent position in the academic community. An expansion of its resident facilities now includes a School of Engineering, School of Systems and Logistics, Civil Engineering Center, and Defense Weapon Systems Management Center.

In addition to its resident programs, AFIT, through its Civilian Institutions Division, monitors the academic programs of some 4,500 officers and airmen attending civilian colleges, universities, hospitals, and industrial organizations located throughout the United States and overseas. Responsibility for this program was delegated to AFIT in August 1947. These programs, which include degree and nondegree at all levels, are designed to





Col. Charles W. Sampson, M.S., P.E.  
Director, Programs



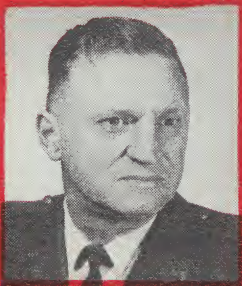
Lt. Col. Thomas L. Parella, M.A.  
Director, Personnel



Lt. Col. Francis A. Farmer, Jr., B.A.  
Comptroller



Maj. John R. Mancus, B.S.  
Director, Administrative Services



Lt. Col. John I. Tibbits, M.A.  
Director, Information



Capt. William G. Dwyer, B.A.  
Director, Materiel Support

## School of Engineering

### Nuclear Engineering Test Facility

## School of Systems and Logistics

## Civil Engineering Center

## Defense Weapon Systems Management Center

## Civilian Institutions Division

## Admissions

## Minuteman Education Program

## Library

meet specific Air Force requirements. This division also monitors the AFROTC graduates whose call to active duty has been postponed while they pursue graduate work at other than government expense.

The Institute has progressed from a non-degree- to a degree-granting institution, and during the period of this report 48 bachelors degrees and 285 masters degrees were conferred on graduates of the School of Engineering and the School of Systems and Logistics. More recently, a doctoral program in aerospace engineering was added to the curricula of the School of Engineering and students were entered in the initial class in June 1965.

When the engineering and test activities at McCook Field required more extensive facilities, they were moved in 1927 to a 4,500-acre tract of land donated to the government by the citizens of Dayton. The new installation

was named Wright Field in honor of Dayton's celebrated native sons, Orville and Wilbur Wright.

Shortly after Pearl Harbor, the school was forced to suspend classes. By that time it had graduated more than 200 officers, many of whom were the nation's foremost wartime and postwar leaders of aviation. In April 1944, the school was reopened so that a series of accelerated three- and six-month courses could be offered to meet emergency needs.

Following the cessation of hostilities in 1945, a survey was made of the educational achievements of the Army Air Force Officer Corps. The results indicated that there was a general lack of academic attainment within the Corps and that a need existed for improving its competence. Shortly after the survey was made, a board of officers was appointed by the Commanding General, Air Technical Service Command (ATSC), to study the problem.



## Aerospace Education-- A Tradition

The board recommended that the Army Air Force establish a technical school under the immediate supervision of the Commanding General, ATSC, and that the existing Army Air Force Engineering School be expanded to accomplish the recommended action.

Other surveys followed, and the recommendations were basically the same. As a result of these efforts, the Army Air Force Institute of Technology was officially opened on 3 September 1946 with a faculty of eight civilians and five officers and an enrollment of 189 officer students.

When the Air Force became an autonomous unit in the military establishment in 1947, the school was renamed the Air Force Institute of Technology. It was also at this time that Wright Field and neighboring Patterson Field were combined into one installation and given the name Wright-Patterson Air Force Base.

Command jurisdiction of the Institute was transferred from the Air Materiel Command to Air University on 1 April 1950.

AFTT's location, at a large center for aeronautical research and development and at the headquarters of Air Force materiel activity, has long been recognized for the many unusual opportunities it offers both students and faculty. The research laboratories and the scientists working in them, the logistical and professional personnel of the Air Force Logistics Command all provide the kind of

environment and atmosphere in which the students will ultimately be working. And the assignment of actual rather than hypothetical Air Force problems gives both students and faculty added advantages.

As technological and scientific research increased, a concomitant increase was noted in the need for more and better-educated base civil engineers. It was for this reason that the Civil Engineering Center was established in 1947. Its courses of study cover all phases of air base construction, operation, and maintenance, with emphasis on the technical, managerial, and administrative functions of the base civil engineer.

In developing professionally-qualified civil engineers who are responsive to Air Force needs, the center has added several integrated professional development programs, including a resident education program, a comprehensive nonresident study course, and a professional engineer registration program. It also publishes a professional journal for the Civil Engineering Utilization Field.

What began in October 1955 as an experimental six-month graduate logistics course led to the permanent establishment of the School of Systems and Logistics. The school, in cooperation with The Ohio State University, offers a 12-month graduate logistics program and a series of continuing education courses in logistics. Students who success-



Major General Grandison Gardner  
(July 1950 - January 1951)



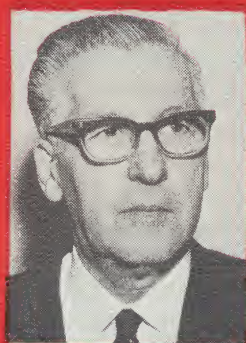
Brigadier General Leighton I. Davis  
(January 1951 - October 1951)



Major General Ralph P. Swofford, Jr.  
(October 1951 - November 1955)



# School of Engineering



R. H. Downing, Ph.D.  
Dean



W. L. Lehmann, Ph.D., P.E.  
Asst. Dean, Research



Lt. Col. J. G. Crouch, M.S.E.  
Asst. Dean, Engineering



## Aeronautical Engineering

H. C. Larsen, M.S., P.E.



## Electrical Engineering

C. M. Ziemann, Ph.D.



## Humanities

H. E. Hand, D.Ed.



## Mathematics

A. B. Carson, Ph.D.



## Mechanical Engineering

A. J. Shine, Ph.D.



## Mechanics

D. W. Breuer, Ph.D.



## Physics

L. S. Pedrotti, Ph.D.



## Systems Management

Col. W. W. Converse, Ed.D.



**B**y the end of the year, the faculty and staff had become settled in the new School of Engineering building, dedicated the previous August, and were enjoying the privilege of working in pleasant and attractive surroundings. More pleasure and satisfaction were derived, however, from the knowledge that the building was a symbol of faith and trust in their educational efforts.

In general, the year was a productive one for the School. It marked the graduation of the first class in the AFIT Minuteman Education Program (details on this are included in another section), the enrollment of the first class of students in the School of Engineering doctoral program, the incorporation of the Air Force Nuclear Engineering Test Facility (NETF) with the School of Engineering for a two-year experimental period, and achievement at the NETF of the first sustained nuclear reaction (criticality).

In February, a member of the Department of Aeronautical Engineering, Professor Peter Biolkowicz, was honored during National Engineers' Week when he was selected as one of ten outstanding engineers in the Dayton, Ohio, area. Selection of the men was based on their achievements in 1964 which contributed appreciably either to scientific knowledge and technological progress or to public welfare and safety. Professor Biolkowicz was recognized for a study he conducted at the request of the Warfare Systems School, Air University, which involved the ground tracking of 24-hour satellites in inclined elliptical orbits with various perigee positions and eccentricities.

The School of Engineering admitted its first doctoral candidates in June. Public announcement of the new program was made on 28 August 1964 during dedication ceremonies for the new School of Engineering building. At that time, Secretary of the Air Force Eugene M. Zuckert read a letter from President Johnson to General Combs, AFIT Commandant, in which the President congratulated the members of the Institute on the occasion of the dedication, and closed with the following words concerning the doctoral program:

*The establishment of a doctoral level program in the aerospace sciences, announced today by Secretary Zuckert, will expand, and strengthen, the important role of the Air Force Institute of Technology in our nation's defense program.*

*This program is in keeping with my recent remarks . . . , directing the Secretary of Defense to strengthen and broaden opportunities available to members of the military services to further their education while still in service.*

The doctoral candidates, 1 lieutenant colonel, 1 major, 7 captains, and 3 first lieutenants, will study at AFIT for two years. In that time they will complete all basic course work and qualifying examinations. They will then be assigned to an Air Force laboratory, filling regularly-assigned military spaces, where they will do research in an area of specific interest to the laboratory in which they are working. This research will provide the material for their doctoral dissertation. Throughout the period of their academic tour, both at AFIT and in the laboratory, they will be under the joint guidance of a laboratory scientist and a faculty adviser.

The first year of the curriculum provides academic course work in physics, mathematics, and mechanics. In the second year, each student will, to a large extent, specialize in his major area of interest. Limited course work to further increase the students' depth of understanding in their major fields will be encouraged while assigned to a laboratory.

The program is interdisciplinary in nature, and students completing the program and satisfactorily meeting the thesis requirements will be awarded the degree of Doctor of Aerospace Engineering.

The doctoral program is administered by a Doctoral Council of twenty AFIT faculty members and administrators, with the coordination of a Laboratory Council composed of one representative from each of the major laboratories at Wright-Patterson AFB. These Councils have the responsibility for selecting students, formulating program content, recommending laboratory assignments, and establishing policy.

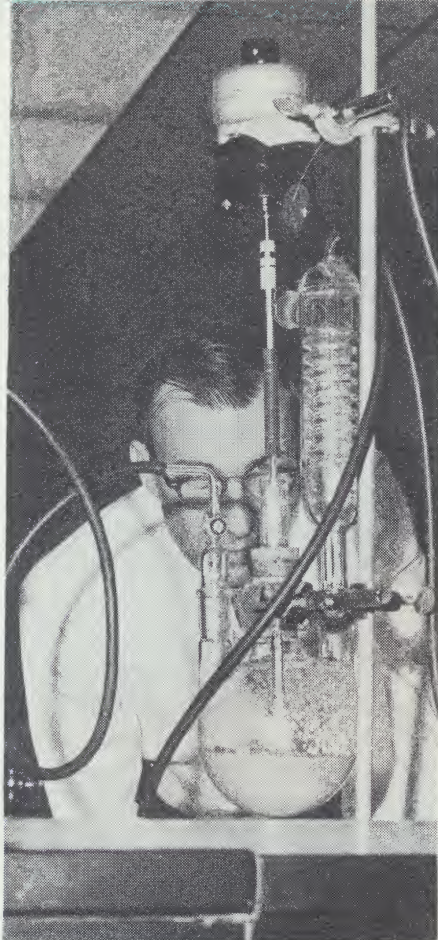


## School of Engineering

*Brigadier General Edward B. Giller, USAF Director of Science and Technology, addressing a graduate space physics class.*







Appropriate accreditation of the doctoral program was received from the North Central Association of Colleges and Secondary Schools following an inspection visit at AFIT by that Association in April 1965.

### Research

The Institute's research work is conducted primarily as an integral and essential part of graduate engineering education; however, every effort is made to insure that the total research capability at AFIT also supports the research and development activities of the Air Force. In faculty research, freedom of choice is maintained as an academic principle, and the interests and resources of on-base laboratories offer an excellent selection of areas from which to choose.

During 1965, the faculty actively participated in 60 research projects, prepared 75

research papers and 13 research technical reports for publication in professional journals, and delivered 22 research papers at professional scientific meetings. Twenty-three members of the faculty are conducting research on projects of specific interest to the following WPAFB laboratories: Aerospace Research Laboratories, Avionics Laboratory, Materials Laboratory, Flight Dynamics Laboratory, Aero-Propulsion Laboratory, and Aerospace Medical Research Laboratory.

Of the 232 students who were awarded masters degrees in 1965, 112 conducted the research for their dissertation under the sponsorship of an Air Force Laboratory. Work on the remaining 120 theses, all of which were Air Force oriented, was conducted at the Institute.

The School's research efforts are supported mainly by the laboratories of the Air Force



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## School of Engineering

Systems Command and the Air Force Office of Aerospace Research. The AFIT School Shops render a specific service, however, by fabricating special items of equipment that either do not exist or cannot be purchased through base supply channels in sufficient time to be useful. This latter situation was improved somewhat this year when Air University initiated changes in the procurement procedures which now make it possible to secure supplies and equipment on a shorter time basis.

### Faculty Exchange Program

For several years, the School of Engineering has participated in a faculty exchange agreement with the College of Aeronautics, Cranfield, England. This arrangement has been enthusiastically supported by both Schools, and mutual benefits have accrued from this cross-feeding of ideas and from the opportunity to study the areas of research being pursued by the other School.

The members who participated in the exchange during the 1965 fall quarter were Professor J. J. Spillman of Cranfield and Major C. K. Grimes of the AFIT Department of Aeronautical Engineering.

### Professional Conferences

Two professional conferences were held at the School of Engineering during 1965—the Third Annual Student Conference of the American Nuclear Society (ANS) and the Conference on Matrix Methods in Structural Mechanics. Members of the AFIT student branch of the ANS and Dr. C. J. Bridgman, faculty adviser to students of the Graduate Nuclear Engineering Program, served as hosts for the ANS Conference held in April. Over 200 students and faculty members from 38 schools throughout the United States were in attendance. Of the ten awards given for the best papers presented, four were won by School of Engineering students.

The Conference on Matrix Methods in Structural Mechanics was co-sponsored by AFIT and the Air Force Flight Dynamics Laboratory (AFFDL). Co-chairmen of the





Conference were Colonel G. T. Buck, Director, AFFDL, and Dr. J. S. Przemienski, Professor of Mechanics, AFIT.

### Facilities

Modern equipment and facilities are as vital a part of effective teaching as is a competent faculty. AFIT's location, in the very center of the largest scientific, research and development, and logistics planning community in the country, provides access to a wide variety of the best and most modern scientific and logistics facilities available.

AFIT, however, does not rely completely on these on-base facilities, but has many excellent research and engineering laboratories which compare with, and often excel, those of its civilian counterparts.

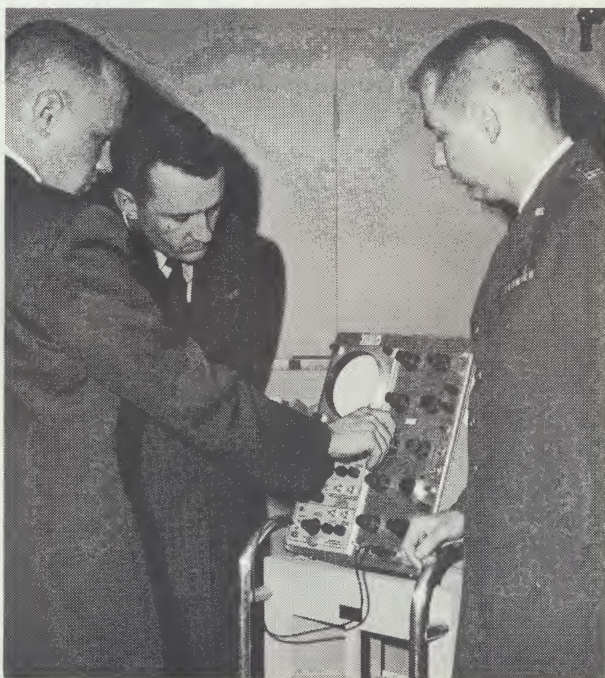
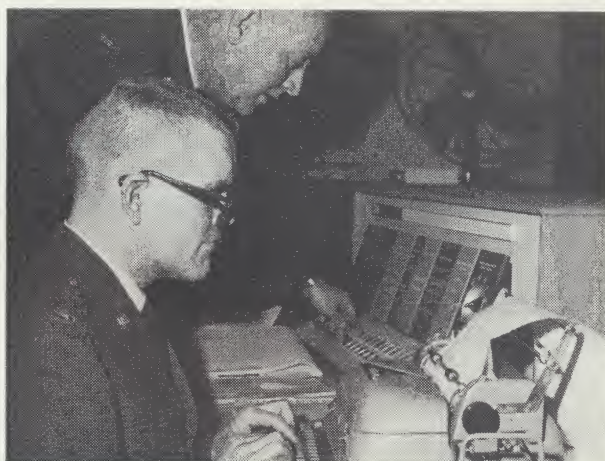
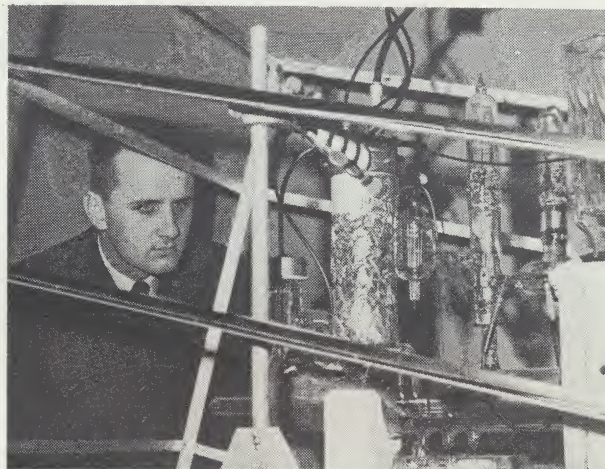
Additions to these facilities during 1965 included two Model TR-48 Solid State and two Model 231-R Non-Solid State Analog Computers. Two more TR-48s will be added in 1966. These computers replace older REAC equipment for instruction in analog computation, automatic control, and research. Also available is equipment for tie-in to the digital computer. A new vertical shock tube is under construction in the Mechanical Engineering Laboratory.

Equipment is on hand for assembly of a 4" x 19" transonic wind tunnel which will have a 6" x 6" interchangeable test section that will produce speeds up to Mach 3. When completed, sometime in 1966, it will be the only facility of its kind on WPAFB.

The Department of Mechanics is in the process of obtaining space simulators that will make it possible for the faculty and students to do research on materials and equipment under conditions similar to those on the surface of the moon or in space.

The addition of these facilities to those already a part of the School of Engineering, plus the scientific equipment and facilities available through other Air Force laboratories at Wright-Patterson, provides a scientific complex of almost unlimited potentials.

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## School of Engineering

### NUCLEAR ENGINEERING TEST FACILITY



Col. J. R. Bohannon, Jr., M.S., P.E.  
Director

All actions required to insure successful prosecution of the Air Force Nuclear Engineering Test Facility (AF NETF) Project were completed on or ahead of schedule during 1965. The AF NETF is a recent acquisition of the Institute and as a research laboratory comes under the purview of the School of Engineering. It is an Air Force-directed and Department of Defense-supported project, and is an outgrowth of the Aircraft Nuclear Propulsion Program. A 10-megawatt reactor with all essential support facilities and equipment (hot cells, counters, computers, etc.), it is the highest-powered steady-state reactor in the Department of Defense, and it is the only Air Force research reactor operated by Air Force personnel.

The official AFIT-NETF assigned mission is stated as follows:

"To develop the potentials of the AF NETF to support research and development, including engineering and applied testing, and to integrate the facility into the Air Force scientific, engineering, and educational community as a new and diversified tool of investigation and inquiry."

The NETF and the services of its staff are available to individuals or agencies of the Air Force or Department of Defense, to their contractors, and to surrounding universities conducting programs in fulfillment of known or anticipated Air Force requirements. Many of these programs include laboratory projects conducted by AFIT students and faculty. In this capacity, it functions both as an educational and as a research tool.

The facility's development program began at the close of 1965 with the functional transfer of the NETF's personnel (formerly assigned to the Air Force Flight Dynamics Laboratory), equipment, and supply accounts to AFIT. The efficiency with which this transfer was handled and the successful completion of the final checkout of all equipment by the building contractors were a direct result of the conscientious and deliberate efforts of all parties concerned.

To date, experiments have been conducted in the NETF in such functional and disciplinary areas as activation analysis, biomedical research, solid-state device analyses, short-life isotopes, radiation effects, and materials development. Participants in these experiments include AFIT faculty and students, Aerospace Research Laboratories; United States Air Force Hospital, Wright-Patterson AFB; United States Atomic Energy Commission; Rome Air Development Center; Avionics Laboratory; Aero-Propulsion Laboratory; Texas Instrument Corporation; United States Army Electronic Command; and the University of Cincinnati.

The successful initiation of these experiments immediately following acceptance of the facility can be attributed to the promotional program conducted by the NETF's Engineering and Experimentation Division. This included the presentation of some 30 briefings to major Air Force laboratories and contractors; the procurement of formal endorsements and support from major air commands, laboratory directors, and other De-



partment of Defense agencies; the issuance of over 2,000 brochures; and communication with over 200 project engineers.

A number of key events lead to the present status of operation:

- Achievement of the first sustained nuclear chain reaction (criticality) at the NETF at 22:27 hours on 5 April,

- Accomplishment of full-core loading and initiation of a program of zero-power calibration and testing on 14 April,

- Approval to operate and maintain the NETF upon completion of a review of the Operations Plan (TR 65-3) and Technical Specifications (TR 65-6) by the Directorate of Nuclear Safety, Kirtland AFB, New Mexico,

- Certification of the qualifications of the checkout crew members by the contractor on 9 November,

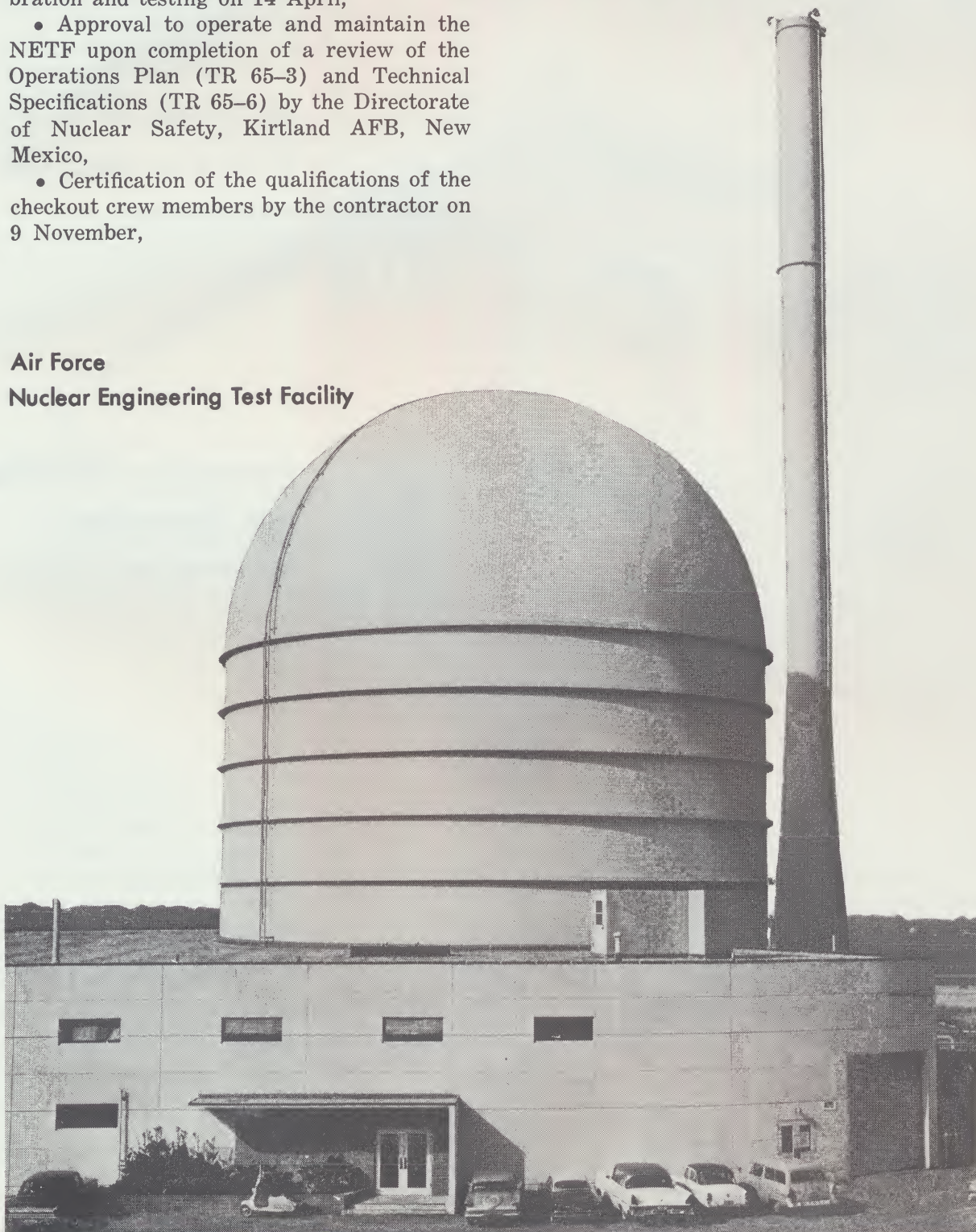
- Acceptance of the operational control of and safety responsibility for the NETF by AFIT on 9 November, and

- Transfer of the facility from the Corps of Engineers to the Air Force Institute of Technology.

On 1 January 1966, the Project Office will begin its two-year development program in accordance with its assigned mission and defined objectives. ■ ■ ■

## **Air Force**

### **Nuclear Engineering Test Facility**





# School of Systems and Logistics



Col. C. A. Stone, Ed.D.  
Dean



## Graduate Education

Lt. Col. W. C. Thompson, Ph.D.



## Continuing Education and Curriculum

Col. R. W. Amick, M.S.





The waging of widespread counter guerrilla warfare in Southeast Asia under the most difficult circumstances has made for a host of logistical problems that do not lend themselves to conventional solutions. Response to this current challenge has resulted in the development of unusual procedures for the determination of logistical requirements, the replenishment of fighting forces in remote areas, and the maintenance of complex weapon systems far removed from supporting depots. Climate, terrain, and the nature of the conflict have compounded these problems. The human need is not only for competence in the ordinary sense, but also for a corps of logisticians who are imaginative and creative in devising new procedures, who are practical in their approach to emergencies, and who are able to apply scientific methods in the practice of their profession.

The School of Systems and Logistics is continually readjusting its curricula to meet the dictates of change. Throughout 1965, programs were expanded in scope to accommo-

date the ever-changing demands made on logisticians, and student enrollments were increased so as to provide more and better-equipped logistical personnel.

This increase in the school's academic and administrative workload made some measure of internal reorganization desirable. In order to improve operational efficiency, three directorates were created: Directorate of Graduate Education, Directorate of Continuing Education, and Directorate of Curriculum. The first is responsible for the accredited, 12-month degree-granting curriculum; the second is concerned with in-house short courses, but has supervisory responsibility for all programs conducted on sites other than Wright-Patterson AFB; and the third has responsibility for continually reviewing all course offerings to determine if they are timely and if they reflect the requirements of the organizations for which they are being given. Each directorate is headed by a director, who reports to the Dean, School of Systems and Logistics.



## Graduate Logistics Program

A Graduate Logistics Faculty Council began functioning in 1965. The Council is chaired by the Director of Graduate Education and normally meets once a week. The Council is empowered to discuss and resolve routine matters, to make policy recommendations to the Dean, School of Systems and Logistics, and to advise him on all matters affecting the Graduate Logistics Program.

The graduate logistics faculty, consisting of eleven full-time and four part-time instructors, was organized into four departments under the new Directorate of Graduate Education: Department of Quantitative Studies, Department of Management Studies, Department of Communicative Studies, Department of Research Studies and Publications. When fully staffed, the Department of Research Studies and Publications will have four scholars who will devote full time to logistics research and writing. If current plans develop, these four will have the added responsibility for editing and publishing a logistics periodical to be distributed in the near future by this school.

## School of Systems and Logistics

Graduation exercises for the Class of 1965 were held in joint ceremonies with the School of Engineering on 25 August. Of the 46 class members, 32 were from the United States Air Force, 7 from the United States Army, 4 from the United States Navy, and 3 from civilian agencies. Ten members of the class were graduated with distinction, having attained a grade point average of 3.75 or better. Each student received a logistics assignment following graduation.

A number of significant research papers were produced by the class as student theses. Thesis subjects were selected from existing logistics problems and the students' findings were sent to all interested field organizations.

The Class of 1966, composed of the full quota of 60 students, reported for processing on 19 August. The entering class was given an intensive five-weeks review in mathematics and English before starting their regular studies.

## Continuing Education Program

The increasing complexity of logistics and the more sophisticated logistical methods in use today have resulted in increased demands from the field for a program of continuing logistical education. To meet this need of the professional logistician, the School of Systems and Logistics established the Continuing Education Program, which consists of some forty short courses from one to fifteen weeks' duration. These courses are designed to provide continuing educational opportunities for managers in systems and logistics or in the functional areas of maintenance, supply, transportation, and procurement.

The size of this resident program has been governed by available living quarters and teaching space rather than by demand. Even under these limiting factors, however, the program has steadily increased year by year, and in its seven-year history, 18,835 students have received certificates of course completion.

Because there are literally thousands of military logisticians who, for one reason or another, will be unable to pursue resident courses, the Assistant Secretary of Defense directed in 1964 that this school establish a nonresident logistics management program. In response to this directive, a Department of Nonresident Studies was created in January 1965 and placed within the framework of the Directorate of Continuing Education. Three general types of nonresident programs are now either in the developmental or operational stage. They include correspondence courses, on-site courses (Zone of Interior and abroad), and international (Military Assistance Programs—MAP) courses. It should be explained that all on-site courses, both in the Zone of Interior and abroad, other than those taught for MAP, are furnished at the request of the receiving agency, and the cost of the instruction is funded by the School of Systems and Logistics. Courses taught in response to MAP's requirements are funded by that agency.

The correspondence courses are still in the developmental stage. The Air University Extension Course Institute, through agreement with the School of Systems and Logistics, will







prepare the "Logistics Management Seminar" as the first correspondence course to be offered. By the end of 1965, several chapters had been received and estimated completion date is 1 August 1966.

The Directorate of Continuing Education has been authorized an increase of six logisticians for its Department of Nonresident Studies to give it sufficient organic capability for writing other planned correspondence courses. These positions will be filled as soon as competent persons can be selected.

On-site instruction within the continental United States during 1965 was accomplished by personnel currently assigned to the Directorate of Continuing Education. Instruction in management of value engineering and defense contracting was given at 22 centers to Army, Navy, and Air Force personnel. Approximately 900 students were scheduled for the courses offered.

Maintenance and procurement courses were presented at various overseas bases in Germany, Hawaii, and Japan. One course presented at several overseas locations, Base Procurement-Base Civil Engineering, was offered with the assistance of personnel from the AFIT Civil Engineering Center.

Other overseas instruction has included a series of logistics management training courses for the Republic of Korea Air Force, and a number of courses relating to resources management for the Republic of China Air

Force. In October, a faculty member served as seminar moderator and lecturer for a management seminar conducted by the Turkish Air Force. A series of lectures on advanced management was presented in November to personnel attending the Philippine Air Force Command and Staff School in Manila.

Current plans for fiscal year 1967 include an expansion of the Graduate Logistics Program and some adjustments to the curriculum. Transportation will not be given as a course but its essential subject matter will be integrated in other courses. A course in logistics planning will replace transportation.

The student quotas for resident courses of the Continuing Education Program have been set by the Air Staff, United States Air Force, at 3,859 for fiscal year 1967, with this breakdown: Air Force-Oriented, 1,325; Air Force-Department of Defense, 1,568; and Non-Air Force, 966.

Development of correspondence courses within the Department of Nonresident Studies will probably begin in the fall of 1966. Eventually a majority of the correspondence courses will be prepared by the Department of Nonresident Studies and administered by the Extension Course Institute, Air University.

Responsibility for on-site courses in the continental United States will be transferred to the Department of Nonresident Studies after 1 July 1966. The Department of Maintenance, Supply, and Transportation, by the addition of 11 officers, will provide instruction for the maintenance courses, and will send traveling teams to each requesting base.

The Military Assistance Program will have a requirement for the training of an estimated 500 personnel during fiscal year 1967. Preliminary reports indicate a requirement to send mobile instructional teams to the Philippines, Australia, Vietnam, Korea, and Peru. Other countries are expected to request training items. A catalogue has been prepared to provide information on the expanded logistics management program for MAP countries.

Over-all, it is significant and worthy of especial note that the Directorate of Continuing Education will instruct more than 7,000 logisticians during fiscal year 1967. ■ ■ ■



# Civil Engineering Center



## Advanced Engineering

Lt. Col. R. D. Marlow, B.S. (CE), P.E.



Col. V. L. Hastings, M.S. (IE)  
Director



## Engineering Orientation

Lt. Col. H. B. Arnold, M.E. (CE), P.E.



## Nonresident Studies

E. E. Peer, B.S. (EE), P.E.



## Research Studies

Lt. Col. D. R. Woods, Ed.D., P.E.





If one word could adequately describe the operation of the Civil Engineering Center during 1965, it would probably be *expansion*. This word could, however, be aptly applied to the Center since its origin in 1948, when less than 100 officers were graduated that year. By contrast, over 900 officers and officer-grade civilians received instruction through AFIT resident and overseas courses in 1965.

When the Center was established in 1947 as the Air Installations Engineering Special Staff Officers Course its mission was to provide the training necessary to update the civil engineering knowledge of base installation officers. A broadening of the scope of base civil engineer duties and the requirement that the Center include instruction for installation engineering officers at all levels of command have made it necessary for the Center to make many changes in its curriculum since the original program was offered. To accommodate these requirements imposed by Headquarters United States Air Force and

various Air Force commands throughout the United States and overseas, the Center has increased its course offerings to eight: Base Civil Engineer, Executive Engineering, Nuclear Defense Engineering, Pavement Engineering, Control Center Management, Network Planning, Applied Engineering, and Cold Regions Engineering.

### Materials Testing Laboratory

A rearrangement of the Center's classrooms, made possible when the school was moved from one building to another, permitted the inclusion of contiguous space for a much-needed modern Materials Testing Laboratory. The original Laboratory, because of its remote location, was restricted to soils testing. In the first six months of operation, the laboratory supported not only students of the Civil Engineering Center but also personnel of the Air Force Logistics Command.





## Civil Engineering Center



By moving to other quarters, it was possible to provide a classroom for the Base Civil Engineer Course that would accommodate a larger group of students at one time. With a maximum enrollment of 75 students per class, three offerings a year will accommodate the same annual quota that previously required four. The advantage of this arrangement is that the instructors can use the extra time to enhance their academic proficiencies or conduct shortened specialized courses overseas.

Preparatory to updating the Nuclear Defense Engineering Course to include instruction on civil defense fallout shelters, a member of the Department of Advanced Engineering attended a five-week course on this subject at The Pennsylvania State University. Following his certification as an Air Force instructor in Civil Defense Fallout Shelter Analysis, the Nuclear Defense Engineering Course was extended from 10 to 14 days to permit instruction on this subject. Students successfully completing the AFIT course are certified as Civil Defense Fallout Shelter Analysts.

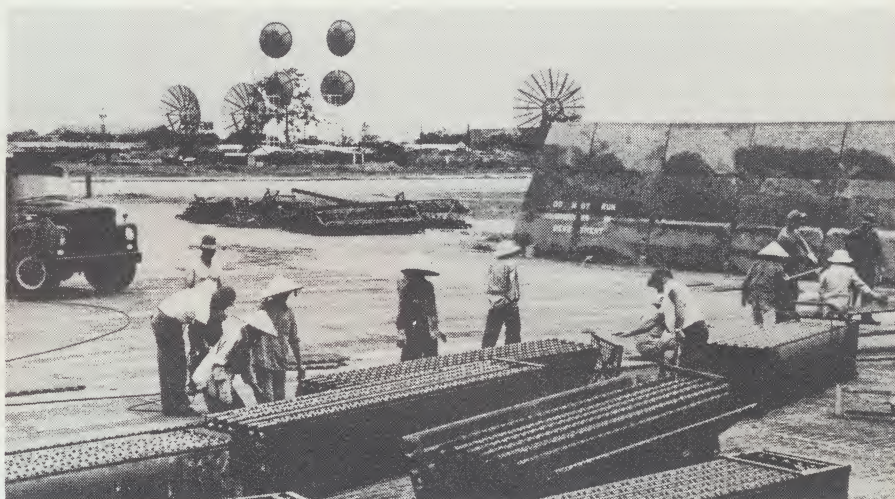
A power simulator, designed by members of the faculty and built by the AFIT School Shops, provides the opportunity to demon-

strate theoretical considerations of practical problems offered as course work in the Applied Engineering Course. By using this device, students now have the opportunity to simulate conditions for observing and correcting power circuit problems.

### Overseas Instruction

In 1964, at the request of Headquarters United States Air Force, Europe, as approved by Headquarters United States Air Force, two members of this organization traveled to Europe and presented the first overseas instruction offered by the Civil Engineering Center. The material presented was a modification of the one-week Control Center Management Course. The instruction was so well received that the Center was requested to give other offerings in 1965 and to increase the bases visited to include Thailand, Hawaii, and Crete. The programs presented were modifications of existing resident courses in control center management and network planning. A traveling team of five instructors made the presentations. There are specific advantages to be gained from teaching an individual in his native environment, where the





instruction can be adapted to existing conditions and problem areas. Providing overseas instruction also makes the programs available to persons who do not find it possible to come to the United States.

The Department of Nonresident Studies has the responsibility for publishing the *Air Force Civil Engineer* magazine. Published quarterly, it is the official nondirective Headquarters USAF departmental publication on civil engineering. The department also published a yearly revision to the *Directory of Registered Professional Engineers and Architects*. In preparing the revision this year, an increase of five per cent was noted in the registration of professional engineers and architects over 1964.

### ECI Course

In addition to the nonresident instruction presented at overseas bases, the Center provides course material to the Extension Course Institute (ECI) at Air University. Since initiation in 1964 of the ECI course entitled Base Civil Engineer, 200 individuals have completed the course and 600 are now

enrolled. Revisions to the course are provided by the Center as required to update the contents.

The Department of Research Studies has the responsibility for conducting research on managerial, organizational, operational, educational, and professional areas relating to present and future Air Force Civil Engineer activities. One phase of its mission is the preparation of a Report on the Qualitative Educational Requirements for the Civil Engineering Utilization Field for use by the Air Force Educational Requirements Board. This Board was established for the purpose of identifying and describing current and future qualitative specialized educational requirements necessary to providing the knowledge and skills needed for entry and satisfactory progress in each officer specialty. To assist the Board members in this task, a panel of experienced senior officers, assisted by military and civilian consultants, was organized for each career area. The Report prepared by the Department of Research Studies contains the recommendations of the Civil Engineering Career Area Panel on the Civil Engineering Utilization Field. The third cycle of this Report was completed by this Department in 1965.





# Defense Weapon Systems Management Center



Col. J. H. Harris, M.S.E.  
Commandant

Activities at the Defense Weapon Systems Management Center (DWSMC) were appropriately summarized by the Honorable Robert H. Charles, Assistant Secretary of the Air Force, in his address to the Center's graduates on 10 December 1965.

"I don't have to tell you that the scientific and technological, as well as the economic and industrial, aspects of national security are in an era of revolution. Since World War II, and particularly during the past decade, the Department of Defense has had to develop new management techniques and attitudes to match this revolution. Beginning with the management system, set up to bring the ICBM into operation, and later the Polaris, the system/project manager device has evolved to the point where it has been accepted and adopted throughout the Department of Defense—and in other agencies as well—to handle the larger and more complex acquisition programs.

"The presence in this class of students from all the military services as well as from the National Aeronautics and Space Administration, the Federal Aviation Agency, Canada, and defense industries, attests to the increasingly widespread use of this management technique. The old tried-and-true methods of management have been replaced by new tools and techniques. Defense managers now use such terms as systems analysis and simulations. Any meeting of systems managers now includes the dropping of such phrases as critical path analysis, PERT, real time, and information retrieval."

Presentation of new management techniques and of the language changes that result therefrom is, of course, the primary mission of DWSMC. One of the newest techniques has an innovator in Mr. Charles himself, who states in a later portion of his address:

"You may have heard of the *total package* concept with which we are experimenting on the C-5A program and which, if successful, we intend to apply to other programs such as SRAM. Stripped to its essentials, the total



package plan is intended to permit the awarding of contracts competitively, where performance and schedule are related to cost, and *on a basis of total responsibility*. These are the key words. But we in the government have for many years been living in an atmosphere of cost-plus and sole source, where more controls by the customer are needed; and this relinquishment of authority will, for many, be a shocking experience. But it must be done if we are to get the best results—performance, schedule, and cost—from our industrial partners, and you are the ones who will have to do it.”

As Mr. Charles emphasized, competition is the purpose behind this development of the total package concept which, although still in the experimental stage, is finding many applications, some of which are used as the basis of lectures and case studies in the DWSMC curriculum. Besides the Air Force's C-5A and SRAM, the Navy equivalent of the total package concept has been used with the A-7A and the OV-10. In the Army, a likely candidate is LOH Avionics.

The authority for DWSMC to provide a total education package in systems management was established in Air Force Regulation 53-9.

### Future Plans

In addition to the current Senior Resident Course, DWSMC is preparing plans for becoming a Center in the true sense of the word. These plans include offerings of resident and non-resident short courses in such subjects as cost estimating, configuration management, and integrated logistics support. A correspondence course is already under way. Seminars, publications, and research of new techniques should establish DWSMC as an institute of systems management.

In a discussion of the Navy's philosophy of project management, Vice Admiral I. V. Galantin, Chief of Naval Material, made the following statement:

“No one knows better than I do the urgent necessity for an immediate increase in the

numbers of men who are thoroughly qualified to occupy key positions in project management. I know also that the other services and other branches of the government similarly have pressing need for people who can categorically take control of a project and say ‘I can do the job.’”

Preparing selected military and civilian personnel of all Department of Defense components to meet that need is the responsibility of DWSMC, for it is here that they are trained in the effective management of programs concerned with the development, acquisition, and integrated logistic support of weapon and support systems. In carrying out its mission, the Center stresses the identification and solution of typical systems/project management problems, and offers a program of instruction that is closely allied with actual rather than hypothetical problems.

### Prime Objective

Because the Center's prime objective is to maximize its service to the military departments, its faculty consists of commissioned officers from the Army, Navy, and Air Force. Selection is based on their academic backgrounds and the managerial skills they have acquired through recent assignments involving systems development and acquisition management.

The program offered by the Center is presented by means of lectures, seminars, case studies, and exercises. The faculty is augmented by visiting lecturers representing line and functional specialties concerned with systems/project management. An important faculty contribution is made by The Ohio State University Research Foundation.

Although the Defense Weapon Systems Management Center has been in existence for only a short time, its graduates are rapidly making their presence known. And with the realization of the planned expansion of the Center's capability to conduct research in weapon systems management concepts and practices, future graduates should make even greater contributions in this field.

■ ■ ■



Programs located at bases of the Strategic Air Command. A discussion of this program is included as a separate part of this report.

Through its civilian institutions programs the Institute maintains close contact with civilian colleges and universities and gains first-hand knowledge of their developments in academic subjects of special interest to the Air Force. This relationship provides AFIT with greater flexibility in meeting its educational requirements, and also provides the opportunity for timely exchange of ideas with educational leaders as a means of evaluating and strengthening all programs offered by the Institute.

The Training-With-Industry program provides the Air Force with a vast source of management and engineering educational experience unobtainable in any other manner. Officers with undergraduate or graduate degrees in engineering or business are provided an opportunity to gain knowledge of the management structure, engineering and produc-

ings, and availability for entry as determined by current Air Force mission requirements form the basis for determining their eligibility.

### Program Control

Each student's program is controlled by his faculty adviser (a company coordinator for TWI students), and by the program monitor in the Civilian Institutions Division. The program monitor must approve the student's initial education plan and any changes to it. Most of the program monitors are recent graduates of an AFIT program and all are fully qualified in the academic areas they monitor. Contacts with students are maintained by staff visits, correspondence, and telephone, and by the use of a monthly publication entitled *Contact*. One of the students at each institution is designated as Liaison Officer, and he is responsible to the Commandant, AFIT, through the Director, Civilian Institutions Division, for the control of all other students attending the same institution. Administrative functions of the Liaison Officers are accomplished with the assistance of Professors of Aerospace Studies at colleges and universities and Company Coordinators at industries, as appropriate.

### Scope of Education

Currently, 3,480 officers and 743 airmen are enrolled in 97 colleges and universities in the United States, in 10 foreign universities, in 26 industries, and in 93 hospitals. Although such programs as medical, Air Force Academy and AFIT instructor, scholarship, and the Distinguished Military Graduate Program of AFROTC require the use of many universities, 82 per cent of the officers in the regular AFIT quota programs are enrolled in 29 colleges and universities, and 90 per cent of the airmen are enrolled in 14 colleges and universities.

### Program Trends

During 1965, a sharp decline occurred in the number of officer students enrolled in engineering degree programs, decreasing from an

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## Civilian Institutions Division

tion methods, and contracting procedures used by major industries in fulfilling Air Force requirements for the development and production of weapon systems and the provision of various kinds of special products and services.

### Selection of Students

Participation in civilian institutions programs is on a voluntary basis for both officers and airmen. Quotas are established by Air Force Headquarters. The AFIT Admissions Division determines the academic eligibility of all students and selects airmen for the Airman Education and Commissioning Program. Selection is based on the airman's academic performance and a review of an evaluation of his potential as an Air Force officer as contained in a board report from his local command. Officers are selected for the program by an Air Force Selection Board. Academic backgrounds, officer performance rat-





enrollment of 974 as of 1 January 1965 to 477 as of 1 January 1966. This downward trend can be attributed primarily to a major reduction in quotas in undergraduate engineering and an equally critical reduction in the availability of officers for graduate engineering programs because of increased Air Force mission requirements world-wide.

By contrast, during this same period, a marked increase was noted in the number of officers enrolled in masters degree programs in management—from 310 as of 1 January 1965 to 560 as of 1 January 1966. This increase was possible because of the availability of a greater number of academically-qualified officers.

The Training-With-Industry program has grown from 23 quota spaces in 1947 to its present quota of 150 spaces for fiscal year 1966. However, because of priority mission requirements, only 92 officers were made available for attendance in the 1966 program. In the absence of any change in these requirements, this program can be expected to remain at or slightly above the current level of participation.

The Category "C" program has shown a marked increase in enrollments during the past year. Currently, there are 1,279 officers in the program, the highest enrollment since the program began. A probable increase in the ceiling for Air Force officers and the need for increased numbers of junior officers should bring about a substantial reduction of Category "C" officers within the next year.

The Airman Education and Commissioning Program with an annual input of 400 airmen and a continuing enrollment of approximately 800 is expected to remain at current levels.

### Degree Attainment

The number of officers receiving degrees from civilian institutions in fiscal year 1965 reached an all-time high in the fields of engineering, biophysical sciences, and management. Distribution of these degrees by academic field and degree level was as follows:

<i>Academic Field</i>	<i>Degree Level</i>			<i>Total</i>
	<i>B</i>	<i>M</i>	<i>D</i>	
Engineering	415	356	20	791
Biophysical Sciences	53	141	20	214
Management	14	248	3	265
Totals	482	745	43	1,270

As indicated in the earlier discussion of declining officer enrollments, the number of officers receiving degrees in engineering and biophysical sciences will be reduced by approximately 50 per cent in fiscal year 1966. On the other hand, the number of officers receiving degrees in management in fiscal year 1966 should increase approximately 33 1/3 per cent. During fiscal year 1965, airmen in the Airman Education and Commissioning Program earned 183 degrees in engineering, 40 in the biophysical sciences, and 103 in management. All degrees were at the baccalaureate level. Since airman enrollment is expected to remain near current levels, the number receiving degrees in these fields in fiscal year 1966 is estimated to be approximately the same as in fiscal year 1965. ■ ■ ■



# Admissions



H. E. Lillie, M.A.  
Director

Since field counseling services are considered the most effective means of acquainting Air Force personnel with the educational opportunities available through AFIT, the Admissions Division expanded this operation during 1965. Periodically, staff members made presentations to AFROTC groups, to students at the Squadron Officer School, and to officers and airmen stationed at bases throughout the continental United States. They also visited twelve overseas bases in the Pacific Air Command. Base commanders and their staffs were extremely cooperative in providing adequate publicity in advance of these visits to insure maximum participation by interested individuals. The Institute is grateful for their support.

During the visits of the field counselors, group briefings were given on the officer and

airman programs, and interested personnel were encouraged to submit an AFIT application for evaluation. They were also offered the opportunity to discuss their applications in individual interviews at the end of the briefings. After an application is received at AFIT and evaluated, the applicant is advised of his eligibility to pursue an AFIT program. If he is not eligible, he is informed of the action he must take to meet the necessary academic prerequisites.

Of the 400 quota spaces available in the Airman Education and Commissioning Program for fiscal year 1966, less than 40 remain for which an applicant has not been selected or identified. As in past years, the most difficult quotas to fill are those in engineering, meteorology, and photographic science. There are strong indications that at least half of the 40 remaining spaces will be filled by 15 March 1966, at which time any remaining spaces will be converted to other academic fields and filled from applications on hand. It is of interest that 175 formal applications are currently on hand, 66 per cent of which are for nontechnical fields for which no fiscal year 1966 spaces remain. The other 34 per cent are for technical fields and were submitted by applicants who are not yet academically qualified but are currently enrolled in additional course work. During the first half of fiscal year 1966, 698 requests for evaluation were received; 425 letters of eligibility were issued; and 297 formal applications were accepted. The fiscal year 1967 quotas have been established and are essentially identical with those for fiscal year 1966. The Airman Education and Commissioning Program Selection Committee will start filling these quotas on a continuous basis in late April 1966 from applications on hand and periodically thereafter from applications as they are received.

Substantial progress was made during this period in the Institute's efforts to update the records of the Academic Transcript Repository. The Repository contains a collection of the academic transcripts of all Air Force officers who are eligible for consideration for AFIT programs. Eligible officers are those



with twelve years or less of total active federal military service. In the initial establishment of the Repository, which was a joint effort of Headquarters United States Air Force, Headquarters Air University, and AFIT, transcript summaries were prepared from each officer's academic record and this information was transferred to electronic tapes for use on computers at Air University. The immediate availability of this information makes it possible to communicate directly with officers about their future educational desires and, where interest is indicated, permits the long-range planning for placing the officers in school.

During 1965, 17,157 transcripts were received for evaluation in the updating project, and the academic records of 27,421 officers were added to the Repository. In conjunction

with this project and others, an evaluation was made of the educational achievements of 37,792 officers to determine grade point averages, academic specialties, colleges attended, and degrees received. A more extensive review was made of the records of 2,577 officers in the compilation of educational summaries for use by the Air Force Headquarters Committee on AFIT Selections in considering fiscal year 1967 applicants.

The lack of officers who could be declared eligible to fill educational quotas in technical fields continued to be a matter of great concern to this organization. The reverse was true, however, in the nontechnical fields; consequently, the number of qualified applicants outnumbered the spaces available for fiscal year 1966 and resulted in intensive competition for these positions. ■ ■ ■







# Minuteman Education Program

Readers of the 1964 Commandant's Annual Report may recall that education programs are being provided at Minuteman Missile bases in the Strategic Air Command (SAC) for the purpose of relieving the monotony and tension associated with the duties of a Launch Control Officer (LCO) and of providing them the opportunity to advance their educational level during their tour of duty. To date, Minuteman Education Programs have been established at five Strategic Air Command bases and a sixth program is scheduled to begin in July 1966.

The first program was established at Malmstrom Air Force Base, Montana, by the School of Engineering in September 1962 and provided an LCO the opportunity to obtain a master of science degree in aerospace engineering. Sixteen officers in this program received their degrees in October 1965, an additional 22 will receive degrees in January 1966, and the remainder are scheduled to graduate by September 1966. A rather high attrition rate has been experienced at Malmstrom due primarily to problems associated with the development of Malmstrom as the first operational Minuteman base. However, the need for such a program and the feasibility of presenting it have been proven. In fact, a second-cycle program has begun at Malmstrom for replacement crew members. Participants in this second cycle, depending on their academic backgrounds, will receive the master of science degree in aerospace engineering at Malmstrom or will complete a sufficient number of courses to enable attainment of a degree in residence at the School of Engineering subsequent to completion of their tour of duty as Launch Control Officers.

Minuteman Education Programs supervised by the Civilian Institutions Division and presented under contract with a civilian university include a master of science degree program in industrial management at Minot AFB, North Dakota, offered by the Univer-



**A**s we review our experiences during the past year, we quickly note the many areas in which truly noteworthy progress has been made. We observe also that at times our plans had to be adjusted to coincide with the urgent demands thrust upon our nation because of its dominant role of leadership in world affairs. This adjustment has presented challenges to our often-demonstrated versatility in accomplishing our purpose—that of providing education to members of the Air Force as set forth in our mission requirements. As we try to envision the future, we are aware that these challenges will continue, and, in all sincerity, we would not have it otherwise, for challenge is the backbone of progress.

Although my tenure at AFIT has been of relatively short duration, I have become extremely conscious of the accomplishments of my most able predecessor, Major General Cecil E. Combs, and of the wonderful support he has received from the faculty and staff. And as I review these achievements, I experience a great sense of admiration for an organization that is able to fulfill its mission so capably while adjusting to changing situations.

The most serious problem has been the difficulty the Air Force has encountered in identifying a sufficient number of technically-qualified officers who can be made available to fill the educational quotas in science and technology. This is due to a number of reasons, but is, of course, conditioned greatly by the conflict in Southeast Asia. If previous predictions of Air Force needs are valid, this could develop into a shortage of potential students for these critical engineering and scientific specialities. As a partial remedy to the situation, AFIT is attempting to develop a means for redirecting the education of officers with baccalaureate degrees in nonscientific fields and for providing refresher and up-dated courses for officers lacking sufficient grades to enter graduate scientific and engineering programs. AFIT's major effort in this direction will be in the School of Engineering where frequently-tested flexibility exists.

The shortage of available officers in critical areas also had an adverse effect on programs monitored by the Civilian Institutions Division. These programs provide for college education for Air Force officers through

*. . . a welcome to the new Commandant . . . a master's degree to an Air Force officer*





regular college-degree programs in civilian educational institutions. Here, also, a reduction in enrollment was especially heavy in the engineering field where the drop was over 50 per cent. However, this was counter-balanced somewhat by an increase in the number of enrollees in management programs.

The Minuteman Education Program is an example of AFIT's capability for establishing programs on short notice to meet Air Force needs and contingencies. This program is

spite of the unexpected initial attrition rate, which resulted from reasons other than scholastic aptitude, the Malmstrom program is clearly a success.

The new doctoral program offered by the School of Engineering marks AFIT's entrance into the highest level of academic endeavor. United States Air Force approval to offer a doctor of engineering science program and appropriate accreditation by the North Central Association of Colleges and Secondary Schools preceded enrollment of the initial class of twelve.

Further evidence of maturity and growth were shown by the strengthening of our mutual faculty exchange program with the College of Aeronautics at Cranfield, England; the hosting of an international conference on structural mechanics sponsored by the School of Engineering's Department of Mechanics; and the hosting of the annual student conference of the American Nuclear Society by the AFIT chapter of the ANS. The visiting lecturer's program, generally in the humanities, has been augmented by a scientific lecture series hosted by the AFIT Sigma Xi Club and sponsored by the Air Force Office of Aerospace Sciences.

The activation of the Air Force Nuclear Engineering Test Facility (AF NETF) and

## The Year in Review

described in detail in another part of this report. However, I would like to note here that AFIT has activated five programs at various Minuteman missile sites since 1962 and is preparing to inaugurate a sixth in July 1966 at Grand Forks Air Force Base, North Dakota. One cycle at Malmstrom Air Force Base, Montana, and the first to be activated, has been completed, and students of this first group were awarded masters' degrees in aerospace engineering in the fall of 1965. In





its acceptance by AFIT as an Air Force research laboratory present another avenue of opportunity through which the Institute may be of service to the United States Air Force. An extensive research program is planned for the NETF, and the work that has been accomplished toward its fulfillment indicates attainment of a high level of achievement.

The School of Systems and Logistics continued to grow and to develop new offerings to meet Air Force requirements. This was particularly noticeable in the continuing education courses, where course offerings were revised, added, or deleted as dictated by the requirements of the using commands. The limitations on resident enrollments in the continuing education courses are those imposed by housing at Wright-Patterson AFB rather than by demand from the using agencies. In order to alleviate this restriction to some extent, but more importantly to provide education when and where it was needed, many short courses were given on site at bases in the United States and overseas. AFIT's activity in on-site work is growing and is further manifestation of our endeavor to meet validated educational needs wherever and whenever we are capable of doing so.

The concept of providing continuing education programs on site emerged as a new

and important contribution of the Civil Engineering Center, particularly in Southeast Asia where new problems of construction became the order of the day.

The new and distinctive program in Defense Weapon Systems Management, sponsored by the Department of Defense, is rapidly proving its effectiveness. Although all AFIT organizations accept enrollees from the other services, the Defense Weapon Systems Management Center is specifically established for this purpose. The wholehearted cooperation provided by the many experts from the services, from the Department of Defense, and from industry who participate as lecturers provide an up-to-date fount of knowledge of inestimable value.

As the year's activities are reviewed in retrospect, it is amazing to note the growth in the size and scope of the operation over that of a few years ago. The fact that over 15,000 students were enrolled in AFIT programs during fiscal year 1965 would seem to prove that the faculty and staff have been successful in their constant efforts to improve the quality of their work and to adjust their methods of operation to ever-changing conditions. The extension of AFIT's influence further attests to its ability to meet Air Force educational requirements at the highest level.

■ ■ ■





# Mission Fulfillment - 1965

## School of Engineering

Degrees Awarded	
BS — Aerospace Engineering	25
BS — Electrical Engineering	25
MS — Aerospace Engineering	40
MS — Astronautics	18
MS — Astronautics—Space Facilities	8
MS — Electrical Engineering	56
MS — Materials Engineering	13
MS — Nuclear Engineering	19
MS — Space Physics	25
MS — Systems Engineering—Reliability	14
MS — Systems Management	23
	<hr/>
	266

## School of Systems and Logistics

Degrees Awarded	
MS — Logistics Management	48
	<hr/>
	48

## Civilian Institutions Program

Degrees Awarded				Program
BS	MS	PhD	*Other	
	27	20		Air Force Academy Instructor
2	41	5	20	Arts and Social Sciences
53	141	20	37	Biophysical Sciences
415	356	20	59	Engineering
14	248	3	4	Management
11	67	104	138	** Medical
		1	3	AFIT Instructor
			111	Training—With—Industry
<hr/>	<hr/>	<hr/>	<hr/>	
495	880	173	372	

\*The column entitled other includes professional degrees, nondegree programs, and students who have completed their course work but have not submitted their theses.

\*\*Includes both Ph.D. and M.D.

## SHORT COURSES

### School of Systems and Logistics

	Students
Advanced Base Procurement Management	78
Advanced Contract Administration	164
Advanced Cost and Economic Analysis	14
Advanced Systems Buying	20
Air Materiel Area/Directorate of Materiel Management	227
Auditing Data Processing Systems	125
Automatic Data Processing System Management	174
Base Procurement/Base Civil Engineering	
Related Management	22
Base Supply Management	69
Contract Administration	204
Contract Law	239
Cost Reimbursement Incentive Contracting	32
Defense Data Management	26
Engineering Data Management	74
Evaluating Contractors' Estimating Systems	42
Fundamentals of Data Systems Analysis	137
Industrial Maintenance Management	144
Industrial Property Administration	76
Industrial Security Management	50
Initial Provisioning	66
Intermediate Management Systems Analysis	11
Laboratory Management of Research and Development	97
Logistics Management	83
Maintenance Management Information Systems	377
Maintenance Management Orientation	64
Management of Quality Control	102
Management of Value Engineering	145
Production Management	59
Program Evaluation Review Techniques	94
Quantitative Methods in Cost Analysis	14
Reliability	117
Scientific and Technical Information	48
Statistical Quality Control I	122
Statistical Quality Control II	53
Systems Program Management	105
Systems Simulation for Programmers and Analysts	22
Weapon Systems Maintenance Management	45
	<hr/>
Total enrollment	3441

### Civilian Institutions Program

	Students
Advanced Safety Management	25
Advanced Management Program	10
Correctional Administration	25
Counseling in Human Factors	75
Flying Safety (United States Air Force)	126
Flying Safety (Military Assistance Program)	25
Ground Safety	50
Indoctrination of Judge Advocate General Officers	70
Missile Safety	25
Motor Vehicle Traffic Management	30
Police Administration	25
Public Relations	64
Executive Program in Transportation	2
Air Transportation Institute	16
Institute on Railroad Management	2
Institute on Industrial Transportation and Traffic Management	6
Ocean Shipping and Foreign Trade Management Institute	1
Package and Material Handling Techniques	2
General Management Course (American Management Association)	4
	<hr/>
Total enrollment	583


### Civil Engineering Center

	Students
Applied Engineering	42
Base Civil Engineer	160
Cold Regions Engineering	14
Control Center Management	193
Executive Engineering	52
Network Planning	157
Nuclear Defense Planning	75
Pavement Engineering	34
	<hr/>
Total enrollment	727

### Defense Weapon Systems Management Center

	Students
Defense Weapon Systems Management	177
	<hr/>
Total enrollment	177





Grissom  
21 July 1961  
(AFIT School of Engineering, '56)

Cooper  
15-16 May 1963  
(AFIT School of Engineering, '56)

Grissom  
23 March 1965  
(AFIT School of Engineering, '56)

McDivitt & White  
3-7 June 1965  
(AFIT-CIP, '59)

Cooper  
21-29 August 1965  
(AFIT School of Engineering, '56)

Borman  
4-18 December 1965  
(AFIT-CIP, '59)

## A Final Word

I cannot close this report on the Air Force Institute of Technology without mentioning how honored I am to have been selected as Commandant. For a long time I have known of the fine work being accomplished here at the Institute, but it was not until I had observed the AFIT operation from a working vantage point and had reviewed the great progress that has been made since its inception, that I was able to fully comprehend the extent of that progress. All who have had a share in the success of the Institute have derived a great sense of satisfaction in being a part of AFIT and of its parent organization, Air University.

While preparing this report, I became especially conscious of AFIT's ability to respond rapidly to the ever-changing educational requirements of the Air Force. We have been justly proud of this flexibility and of the good uses it has been put to in the past. However, as we look to the challenges of the future, conditioned by threats from numerous actual or potential trouble spots around the world, this ability to adjust quickly to new situations is clearly of especial importance in forging an effective Air Force.





## Contact

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Wright-Patterson Air Force Base, Ohio

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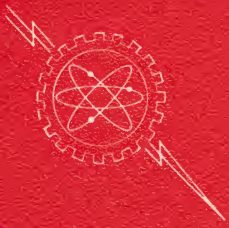
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### PROFESSIONAL MILITARY EDUCATION

MAXWELL AFB, ALA.---Although Air University is charged with a highly diversified mission, its foremost objective is to fill the Air Force's constant need for top quality officer leaders.

The professional educational center of the U. S. Air Force achieves this goal primarily through its three professional military institutions -- Air War College, Air Command and Staff College, and Squadron Officer School.

These institutions were founded to streamline the professional military competence of Air Force officers. They do this through a progressive program of education aimed at broadening the student's perspective while increasing his professional competence.

An indication of how well Air University achieves its mission can be gathered from the fact that many of the current Air Force leaders are graduates of the command's schools.

For instance, of the 12 four-star generals in the Air Force, four are Air War College graduates. Fifteen of the 38 lieutenant generals and about half of the major generals and brigadier generals in the Air Force have also attended the college.

-MORE-



*Strength Through Knowledge*



Air War College is the Air Force's top professional institution where one 10-month course is conducted each academic year. Classes, with an average quota of 280 students, are composed of a select group of men brought together for graduate-level study of national military security and international affairs.

Air Command and Staff College, ranking second in prestige to Air War College, grooms its students (senior captains and majors) for field grade assignments by instructing them in sound Air Force command and staff doctrine and practices. Classes run nine months with a quota of 600 students.

The Squadron Officer School is the first rung on the professional educational ladder. It conducts three 14-week courses every year. Each class normally has a quota of 777 lieutenants and captains.

